HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES PROGRAMS

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 500 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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ERRATUM

HAPAB 5(3), March 1972, p.98:

The citation as originally listed was incorrect. Correction is as follows:

72-0430. Anonymous. **Scientists show indexes of pollution.** *Chem. Eng. News 50(2): 33, 35; 1972.*

72-0888. Forbes, L. S. (Dept. of Physiology and Anatomy, Massey U., Palmerston North, New Zealand). **Organophosphorus poisoning, hyperglycaemia and nicotinic actions of acetylcholine.** *Aust. Vet. J. 47(12): 623; 1971.* (3 references)

A previous Letter-to-the-Editor in *Aust. Vet. J. 46(11): 560; 1970* (see abstract 71-0988) reported the occurrence of hyperglycemia in the course of malathion poisoning in fowls, but stated that the reason for this manifestation is unknown. The writer of the current letter points out that accumulation of acetylcholine due to cholinesterase inhibition by organophosphates has muscarinic and nicotinic consequences. The nicotinic effects include stimulation of the sympathetic ganglia and the adrenal medulla, which can result in an increase in circulating catecholamines, followed by a rise in blood glucose levels. If nicotinic mechanisms play a significant role in glucose release, administration of a ganglionic blocking agent prior to treatment with malathion or another organophosphate could be expected to inhibit the development of hyperglycemia.

72-0889. Westing, A. H. (Windham College, Putney, VT 05346). **Herbicides as weapons in South Vietnam.** *BioScience 21(24): 1225-1227; 1971.* (145 references)

This bibliography lists all published materials on the subject of herbicides as weapons in South Vietnam (excluding most news items, letters, reviews, very brief notes, etc.) that have come to the attention of the author through October 1971. The author requests that readers inform him of any items which are not included.

72-0890. Saila, S. B. (Dept. of Oceanography, U. of Rhode Island, Kingston, RI 02881). **Mercury and marine fisheries.** *Community Health 3(3): 129-132; 1971.*

The question as to whether reported levels of mercury in certain marine fishes, such as tuna and swordfish, are due to global mercury pollution is discussed. The uses, properties, and toxicity of mercury are briefly discussed. Many organomercurial compounds have relatively low toxicity compared to methylmercury, but methods of mercury analysis do not distinguish among the various derivatives. The amount of mercury put into the marine environment by man is about equal to that entering by natural means. Furthermore, the amount of mercury ingested by marine organisms in areas of concentrated discharge is faster than the rate of elimination, but tuna and swordfish are wide-ranging predatory fishes in the open ocean and are seldom found around polluted coastal areas. The arbitrary permissible limit of 0.5 ppm of mercury established by the U. S. Food and Drug Administration appears to be very close to, or exceeded by naturally occurring levels in some large predatory fishes. The author believes that health hazards from eating tuna and/or swordfish in normal amounts have probably been over-emphasized and that the global problem of mercury pollution has been exaggerated. Although there are serious mercury pollution problems, they appear to be of a local nature, and every effort should be made to eliminate this environmental contamination at the point of its discharge. The problem now demands vigorous legislative action on local and national levels.

72-0891. Caldwell, R. L. (U. of Arizona, Tucson, AZ 85721). **What's the real story? Mercury in the environment.** *Crops Soils 24(6): 13-15; 1972.*

A large portion of the mercury in the environment is derived from natural sources and distributed into the air and water by volcanic eruption, biological activity, evaporation from natural deposits or weathering of rocks. Since the difference between naturally occurring levels of mercury and the toxic level is small, it is important that man minimize his contribution to the environmental mercury level. Average concentration ranges are: soil, 10 to 50 ppb; water, 0.03 to 5 ppb; air, 1 to 200 ng/cubic meter; coal and oil, up to 30,000 ppb; foods other than fish, 5 to 60 ppb. Fish contains concentrations higher than 1000 ppb. Agricultural use, including industrial use of fungicides and bactericides, accounts for less than 4% of the mercury used in the U.S. The greatest source of contamination is its use in the production of chlorine-caustic soda and plastics. Inorganic mercury from industrial river discharges can be converted by fish and microorganisms into the more toxic methyl mercury. The use of alkyl mercury fungicides has been restricted in the U. S. because they are more easily converted into methyl mercury than aryl mercury compounds. Better disposal methods for excess treated seed, recycling of containers used for products containing mercury, use of nonmercurial fungicides when possible and greater emphasis on following directions for pesticide use could reduce the hazard of contamination through the agricultural use of mercury.

72-0892. Hori, M. (Inst. of Environmental Toxicology, Suzuki-Cho 2-77-2, Kodaira-shi, Tokyo, Japan). **[An outline of the Institute of Environmental Toxicology.]** *Kongetsu No Noyaku (Agr. Chem. Mon.) 16(2): 56-59; 1972.* (Japanese)

The author, head of the Japanese Plant Protection Association, is also the Director of the recently opened Institute of Environmental Toxicology in Tokyo. The activities of this Institute relate to pesticide residue analysis in or on plants, animals and environmental areas, and investigation of the biochemical, carcinogenic and teratogenic effects of such residues. The Institute's main building accommodates the chemistry, toxicology, and administrative departments along with the animal colony (consisting of 20,000 small animals and a few dogs and monkeys). The animal facilities provide for controlled rearing in a specific pathogen-free state. Modern analytical apparatus, much of it computerized, is available. Power plant and waste disposal facilities are housed in an adjacent unit.

72-0893. Nielsen, S. W. (Dept. of Animal Diseases, Coll. of Agriculture and Natural Resources. U. of Connecticut, Storrs, CT 06268). **Environmental pollutants pathogenic to animals.** *J. Amer. Vet. Med. Ass. 159: 1103-1107; 1971.*

Chlorinated hydrocarbons are the most recently recorded agents causing environmental pollution on a worldwide scale. Insecticides such as DDT, DDE, endrin, and dieldrin deteriorate slowly and may have half-lives of up to 15 years. The compounds become incorporated into atmospheric clouds and enter streams and rivers by rainfall and erosion. Lake Michigan, Narragansett Bay and the Connecticut River are cited as examples of high chlorinated hydrocarbon pollution. Similar to chlorinated hydrocarbon pesticides, polychlorinated biphenyls (PBC) are not biodegradable. They have been shown to be teratogenic, have estradiol degrading potential, and lower resistance to infection and mortality when tested in ducks. Determinations by gas-liquid chromatography are difficult because of chemical similarity to DDT and DDE. The use of mercurial compounds as antimicrobial agents to prevent growth of fungi in seed grains also contributes to terrestrial pollution. Information is needed on the location and economy of the generators of pollutants, the ultimate fate of pollutants, the effects of pollutants on various animal species, pathogenesis of diseases caused by pollutant compounds and thresholds of toxicosis for each pollutant compound.

72-0894. Deshumkh, S. N.; Chawla, R. P. (Pesticide Residue Lab., Dept. of Zoology-Entomology, Punjab Agricultural U., Ludhiana, India). **Tolerance limits of insecticides and their fixation.** *Pesticides 5(11): 11-13; 1971.* (9 references)

In India there is an urgent need to formulate a policy for assessing insecticidal residues in the food and feed produced and imported. Differences in food consumption, climatic conditions, cropping patterns, the nature and distribution of pests, pest control practices, economic motivation and degree of advancement create a need for tolerance limits designed for specific countries and areas within the countries. The resulting dissimilar restrictions interfere with international trade of agricultural products, but importation could be carried out safely by insuring that the potential daily intake of residues (including that amount attributable to imported products) is less than the acceptable daily intake. In Canada, the U.S., Australia, New Zealand, and the U.S.S.R., official tolerance limits are based on similar factors: maximum dose level (ppm in the diet) that causes no significant deleterious effect in the most sensitive species of animals, average body weight of man, a safety factor of from 20 to 100, and the weight of the average *per capita* consumption of the food in which residue may occur. In the U.S.S.R., the National Commission consisting of administrators and experts from the Department of Health, Agriculture and Chemical Industry must adopt unanimously the tolerance limits before a new pesticide is introduced.

72-0895. Anonymous. **The nomenclature of chemicals used in pest control.** *Rev. Appl. Entomol. 59: 1-12; 1971.* (2 references)

A consolidated alphabetical list of the common and other names of chemicals used in insect control which are normally cited in *Rev. Appl. Entomol.* without further definition, is presented, updating the previous list, published in 1965. Those terms approved by the Committee on Insecticide Terminology of the Entomological Society of America and by the British Standards Association have been incorporated. Chemical names or definitions are provided for each term, as well as other names, including trade names, where applicable. Approximately 250 chemicals are included.

72-0896. Borzelleca, Jr., J. F.; Drill, V. A.; DuBois, K. P.; Frawley, J. P.; Goldberg, L.; Hayes, W. J.; McCollister, D. D.; Roudabush, R. L.; Scala, R. A. (Society of Toxicology, P. O. Box 45, Linden, NJ 07036). **Use of 2,4,5-T.** *Science 174(4009): 545-546; 1971.*

A charge made in a Letter-to-the-Editor in *Science 173(3997): 610, 612; 1971* (see abstract 71-2347) concerning the scientific community's acceptance of the report of the advisory committee of the Environmental Protection Agency (EPA) on 2,4,5-T is answered by the council of the Society of Toxicology. The council states that the fundamental issue involved is the safety evaluation of 2,4,5-T. An overwhelming majority of toxicologists has supported and endorsed the EPA scientific advisory committee's recommendations on the use of 2,4,5-T. The authors point out that government scientists have repeatedly made judgments, supported by majority opinion of the toxicology profession, that the teratology data did not justify a conclusion of health hazard to the public. The authors believe that the EPA administrator's setting aside of the recommendations of the EPA advisory committee is a disservice to his own scientific staff and has shaken the confidence of toxicologists in the scientific integrity of his agency.

72-0897. Weinberg, A. M. (Oak Ridge National Lab., Oak Ridge, TN 37830). **Use of 2,4,5-T.** *Science 174(4009): 546-547; 1971.*

In a Letter-to-the-Editor it is pointed out that a possible explanation of the controversy centering around the hazards of the concentration of 2,4,5-T in food chains, as discussed in a Letter-to-the-Editor in *Science 173(3997): 610, 612; 1971* (see abstract 71-2347) might be that the questions are trans-scientific, that is, such questions are seemingly a part of science, but are incapable of resolution by science. Problems inherent in attempting to solve a trans-scientific question scientifically include: (1) uncertainties in extrapolating quantitative dose effects from animal to man and (2) that a null experiment, one which shows no biological effect at low levels of insult, does not prove the insult is harmless, since a larger experiment might show effects. The author suggests that some version of an adversary procedure is

presently the best method for resolving the trans-scientific questions underlying many of today's conflicts between science and technology, and society.

72-0898. Westing, A. H.; Pfeiffer, E. W. (Windham Coll., Putney, VT 05346.) **Use of 2,4,5-T.** *Science 174(4009): 547; 1971.*

In a Letter-to-the-Editor, the authors state their belief that, in view of Environmental Protection Agency (EPA) Administrator Ruckelshaus' recent decision that public health considerations demand the maintenance of severe restrictions on the use of 2,4,5-T, the remaining amount of 2,4,5-T (3×10^6 kg) in Vietnam should be destroyed now. Despite the ruling which is applicable only within the U. S. legal jurisdiction, the South Vietnamese government is continuing to use the chemical.

72-0899. Arnold, W. E. (Plant Science Dept., Agricultural Experiment Station, Brookings, SD). **Herbicide pollution.** *S. Dak. Farm Home Res. 22(2): 38-39; 1971.*

Of the three types of environmental pollution caused by the misuse of herbicides, air pollution may be the most costly and dangerous, since air-borne herbicides may reach desirable but susceptible plants. By spraying under ideal weather conditions, decreasing the distance from the nozzle orifice to the target and eliminating fine droplets from the spray, drift hazards can be minimized. Materials, such as Dacagin, Norbak and Vistik, have been introduced to increase the viscosity of the sprays. Research will be done at the Agricultural Experiment Station on increasing viscosity by the use of a water-in-oil emulsion. Other ideas to be tested include the use of a high density foam spray and the use of polymerized herbicides.

72-0900. Blok, A.; Astolfi, E.; Higa, J.; Schmidt-Hebbel, H. (Universidad de Buenos Aires, Buenos Aires, Argentina). **Principales conclusiones del panel sobre "Residuo de pesticides en alimentos". [Principal conclusions from the colloquium on "Pesticide residues in foods".]** *Sem. Med. 136(1): 18-19; 1970.* (Spanish)

The complete lack of international controls in the field of pesticides is due to the multitude of biological and agricultural factors and to the economical aspects involved. The ambiguous term of "tolerance" for a certain pesticide is determined by two basic criteria, the toxicological and the agricultural one. Agricultural criteria differ according to soil, climate and culture and thus vary for different countries. This national characteristic of the agricultural criterion is producing considerable difficulties on the international food market. A country with low tolerance limits cannot afford to import foods from countries with higher tolerances. The importance of the establishment of realistic toxicological criteria to provide optimum protection of agricultural goods is emphasized.

72-0901. Fukami, T. (National Inst. of Agricultural Sciences, Nishigahara, Kita-Ku, Tokyo, Japan). **[Observations on the 4th Symposium of Pesticide Science.]** *Shokubutsu Boeki (Plant Prot.) 26(2): 85-86; 1972.* (Japanese)

The fourth Symposium on Pesticide Science was held in Tokyo on November 20, 1971, under joint sponsorship of 5 Japanese scientific societies. Of the five topics discussed, four dealt with alternate controls, namely: substances related to plant resistance to diseases, ethylene as a controller of plant physiology, chemical communication on insect mating, and utilization of bacterial toxins as pesticides. The fifth was a lecture on "Conditions affecting degradation of pesticides by microorganisms in soil", by Dr. Kosaka of the Agricultural Institute of Tohoku University. The distribution of soil microorganisms is affected by such factors as soil structure and water and organic matter contents. Addition of pesticides to soil may alter the distribution of the microbial population by being more toxic to some than to others, provoking the development of resistance in some species, or serving as a microbial carbon or nitrogen source. However, the study of the fate of pesticides applied in natural surroundings is extremely tedious, due to the complex interactions of the various factors involved.

72-0902. Alford, H. G. (Pesticides Regulation Div., Environmental Protection Agency, South Agriculture Bldg., Washington DC). **Pesticide registration under EPA.** *Soap Cosmet. Chem. Spec. 48(1): 49, 77; 1972.*

The director of the Pesticides Regulation Division (PRD) of the Environmental Protection Agency (EPA), speaking at the 58th annual meeting of the Chemical Specialties Manufacturers Association in Washington, Dec. 7, 1971, discussed the recent organizational changes in the PRD and their probable consequences. The shift of the PRD from USDA to EPA reflected a changing attitude toward reliance on chemicals for complete pest control. Recent significant actions of PRD include cancellation of all uses of DDT, aldrin, dieldrin, and mirex, and suspension of some uses of 2,4,5-T and mercury, all of which are undergoing further review. The proposals for the Federal Environmental Pesticide Control Act of 1971, primarily dealing with pesticide registration, are listed. The reorganization of PRD along functional lines with setting of standards, registration and compliance sections was intended to provide for increased consistency of requirements and review, and for smooth operation of the registration process with maximum protection to the public.

72-0903. Kawai, S. (Ministry of Agriculture and Forestry, Tea Research Station, Japan). **[Recent studies on tea culture. Part 2.]** *Nogyo Gijutsu (J. Agr. Sci.) 27(3): 102-106; 1972.* (Japanese)

Recent studies on tea culture in Japan are outlined, with particular reference to the development of

tea-picking machinery, newly observed diseases, new studies on insect pests, and the safe use of pesticides. A fairly large number of pesticides has been registered for tea growing, and although actual standards for residues on tea leaves have not yet been established, the minimum number of weeks between application and harvest is officially fixed, based on the results of odor-disappearance (organoleptic) tests on treated and processed tea leaves. These intervals are as follows: 1 week for phosaron, naled, cartap, dichlorvos, and salithion; 2 weeks for Meobar, Fujithion, binapacryl, daconil, difolatan, Vegita, chlorfenvinphos, trichlorfon, mecarbam, and neotran; 3 weeks for azoxybenzene-Sumite, EPN, micro-carbaryl, Imidan, chlorbenzylate-dimite, Estox, fenitrothion, dicofol, Omite, Bassa, and inorganic copper; 4 weeks for cidial, Nissol, and petroleum distillate; and 7 weeks for calcium sulfide.

72-0904. Farris, D. E.; Sprott, J. M. (Texas A & M U., College Station, TX 77843). **Economic and policy implications of pollution from agricultural chemicals.** *Am. J. Agric. Econ. 53(4): 661-662; 1971.* (8 references)

The practice of paying farmers to withdraw land from use and then providing a price support that gives incentive to apply amounts of fertilizers and pesticides to increase yields on the remaining acreage is an important factor in producing pollution. If a market quota were introduced instead of the present method of limiting surpluses, it would reduce the incentive to obtain maximum output per acre. Economists have long argued that acreage control resulted in a misallocation of resources. More expensive or less efficient substitutes would probably result from the withdrawal of certain chemicals as a means of reducing pollution. A basic change such as the one suggested, in which supply control and price supports could be accommodated, could either reduce the incentive to apply chemicals or slow the rate of increase in the level of application.

72-0905. Truhaut, R. (Centre de Recherches Toxicologiques de la Faculte des Sciences Pharmaceutiques et Biologiques de l'Universite Rene Descartes, Paris 6e, France). **Etat actuel de probleme des limites admissibles ou tolerables pour les agents chimiques potentiellement toxiques dans les ambiances professionelles. [Current status of the problem of the permissible or tolerable limits of potentially toxic chemical substances in the occupational environment.]** *Arch. Mal. Prof. Med. Trav. Secur. Soc. 32(4-5): 353-370; 1971.* (15 references) (French)

Cooperative efforts to establish permissible or tolerable concentration limits for various chemicals in the occupational milieu were begun in the nineteen-fifties under the sponsorship of various international organizations. At the Second International Symposium on the Tolerable Limits for Toxic Substances in Industry, Paris, 1963, substances were classified as directly toxic, irritating or sensitizing; predominantly cumulative in action (this group included most pesticides); or carcinogenic. Studies of these groups by experts from various countries brought agreement on approximate tolerable concentrations of some substances; on others, including chlordane, lindane, heptachlor and malathion, the values diverged widely. Values accepted by Soviet experts were generally an order of magnitude lower than those accepted by U.S. health experts. As president of the subcommittee for the study of tolerable limits of the Permanent International Commission on Occupational Medicine, the author initiated the establishment of 10 working groups to study data for various classes of chemicals, and an eleventh to study the methodology of toxicologic evaluation.

72-0906. Fournier, E. (Faculte de Medecine a Lariboisiere-Saint-Louis, 200, rue du Faubourg-Saint-Denis, Paris 10e, France). **Impregnation par pesticides des etres humains. [Pesticide contamination in humans.]** *Cah. Nutr. Diet. 6(3): 31-35; 1971.* (3 references) (French)

Based on a review of pesticide contamination in the human milieu, the author proposes the establishment of a comprehensive pesticide monitoring program for human tissues. This program must proceed in conjunction with the continued improvement of analytical methodology and with the legislative establishment of residue tolerances in human foods and animal feeds. The need for extensive studies is demonstrated by the author's own preliminary work, which revealed 5.2 ppm DDT, 1.90 ppm *p,p'*-DDT, 0.15 ppm heptachlor epoxide and 0.15 ppm BHC in adipose tissue collected in 1969 at autopsy from French adults not occupationally exposed to pesticides. These figures are similar to those found for an analogous group in 1961, and are generally higher than those reported for Britain in 1965 to 1967. Organochlorine levels in blood, urine and human milk under various circumstances (geographical location, mode of exposure) are also discussed. The potential utility of the induction of liver microsomal enzymes with other drugs in order to accelerate pesticide excretion appears limited. Contamination of the human environment by organomercurials appears to represent a threat as serious as that of the organochlorines in some regions.

72-0907. Derache, R. (Faculte des Sciences de Toulouse, France). **Recherches en matiere d'additifs, de pesticides et polluants des aliments. [Studies on additives, pesticides and contaminants in foods.]** *Cah. Nutr. Diet, 6(3): 68-69; 1971.* (French)

In order to improve the general public's level of understanding regarding foreign materials in foods and their implications for the consumer, the author defines and discusses pesticides, additives and contaminants in foods. In contrast to a food additive, which must be demonstrably innocuous, a pesticide is a poison which is

acceptable for agricultural usage. Obtaining authorization for pesticide use is extremely expensive, requiring the investigation of short- and medium-term toxicity, effects on offspring, carcinogenic properties, biodegradation and analytical detection. The use of pesticides is one of the "calculated risks" taken by societies attempting to provide a higher standard of living. It is not the pesticides themselves, but their misuse which is to blame for most untoward incidents, and which must therefore be combatted via education of users and regular monitoring. Simple tests suitable for routine monitoring of commodities include bioassays and chromatographic tests on food extracts, and pesticide determinations in the water supplies of agricultural regions.

72-0908. Pergamon Press Ltd. (Headington Hill Hall, Oxford OX3 OBW, England). **New Journal Announcement.** *Chemosphere 1(1): v; 1972.*

Chemosphere is a new letters journal intended for the publication of original, significant short communications reporting scientific investigations in the fields of chemistry, physics and biology as they relate to environmental affairs. "Emphasis will be placed on the evaluation of changes in the atmosphere, in water and on land in relation to plants, animals and man", according to the statement of aims and scope. Preference will be given to papers which describe new or improved methods or techniques, or present positive experimental results. Negative or confirmatory results will be published only when of special significance. Communications will be published in English, French and German. Manuscript specifications are described in detail. Abstracts of pertinent articles from this journal will appear in the appropriate sections of this and future issues of HAPAB.

72-0909. Panel on Monitoring Persistent Pesticides in the Marine Environment of the Committee on Oceanography. (National Academy of Sciences, Washington, DC). **Chlorinated hydrocarbons in the marine environment.** *(Distributed by National Technical Information Service PB 204 738), 1971. 42 p.* (81 references)

About one-fourth of the total quantity of DDT produced to date (integrated production estimated at 2×10^{12} g) may have entered the ocean, and is presumed to reside currently in solution and in bottom sediments, with small fractions present in marine organisms and in the surface layer. Because of high localized levels near pollution sources or the occurrence of bioconcentration, harmful effects of this DDT quantity have already been observed in crustaceans, molluscs, fish and birds, and concentrations toxic to phytoplankton may conceivably develop in ocean surface films. The half-lives of chlorinated hydrocarbons in the marine environment are unknown. If these compounds degrade with half-lives of decades or longer, man will not have sufficient time to forestall any harmful effects discovered in the future. Therefore, the Panel makes three recommendations: that a massive effort should be made to reduce the escape of persistent toxicants into the environment; that baseline distribution and long-term monitoring studies for pollutants of the marine environment should be established; and that legislation relating to approval of chemicals and availability of production information should be reexamined in the light of environmental effects. A preliminary baseline sampling program is proposed in one Appendix, and a program for identifying distributions and concentrations of man-introduced materials in the atmosphere and oceans in another.

72-0910. Patterson, C. (California Inst. of Technology, U.S.A.). **Zagryazneniye vneshney sredy svintsom. [Environmental pollution by lead.]** *Gig. Sanit. 36(11): 89-94; 1971.* (16 references) (Russian)

A lecture presented at the Second International Congress on Oceanography is reproduced. Topics reviewed emphasize the threat posed by lead contamination of oceanic waters, air, and food to human health, and the continuous conflicts arising between economic and public-health considerations under conditions of modern technology. The average American ingests 350 μg of Pb daily with food and water and 20 to 50 μg from the air; he carries a lead burden of 200 μg Pb in his body, with 0.25 ppm Pb in the blood stream. The U.S. Public Health Service was involved in studies concerning health hazards from lead salts used in apple-tree spraying as early as 1939. A 7 ppm residual level was considered, at that time, to be of no harm to man. Recent data indicate that food contamination at 1.5 ppm Pb produces lead poisoning within one month. A call for higher priority for public health is made.

72-0911. Loefroth, G. (Department of Radiation Biology, U. of Stockholm, Sweden). **Miljoegifter, maenniskan och laekaren. [Environmental poisons, man and the physician.]** *Laekartidningen 68(18): 2113-2122; 1971.* (22 references) (Swedish)

General problems of environmental pollution and existing or potential hazards for man in chronic exposure are outlined. For methylmercury, which has a genetic effect and damages brain cells, the maximum allowable daily dose is 30 μg/person. Poorly degradable chlorinated hydrocarbons such as DDT, dieldrin, and polychlorinated biphenyls (PCB) caused considerable changes in the ecologic system. PCB was detected in the environment in important concentrations in 1966. The domestic use of DDT and lindane is prohibited in Sweden. Chlorinated naphthalenes, once used in Sweden, represent a potential risk. Sulfites used on potatoes may have genetic effects. Slight but significant carcinogenic effects of DDT, amitrol and cyclamates have been revealed in test animals. Oral diethylnitrosoamine doses of 14.2 mg/kg/day and 0.075 mg/kg/day caused cancer in half of the rats investigated after 68 and 840 days, respectively. The internationally accepted

maximum allowable concentration of 90 mg/m^3 for ethylene oxide is too high, because of the genetic effect. Diethylcarbonate, used in wine, showed teratogenic effects in hamsters. Tetrachloro-benzo-*p*-dioxin (TCDD), a contaminant of the pesticide 2,4,5-T, affects fetal development, without causing malformations. It is not yet detectable in the environment.

72-0912. Anonymous. **Two experts testify at public hearings on DDT.** *N. Engl. Mar. Resour. Inf. (33): 1,4; 1972.*

The testimonies of two scientists, Dr. Clarence Tarzwell and Dr. Ronald Eisler, at the Environmental Protection Agency's hearings on DDT indicate that this compound and other organochlorines are extremely detrimental to aquatic life. In ponds studied by Dr. Tarzwell, ten hand spraying treatments with 0.1 lb of DDT per acre resulted in the death of almost all living organisms. While reduction of mayfly and other preferred fish food populations was achieved, nematodes and oligochaete worms of minor value increased greatly in number. The order of toxicity of some organochlorines seems to be endrin, toxaphene, dieldrin, aldrin, and DDT. Marine molluscs are more resistant to DDT than are fishes and crustaceans. An increase in egg case production in snails held for 96 hrs in concentrations of 10 ppb DDT suggests that the population structure of an estuary or bay could be seriously altered by its use.

72-0913. Anonymous. **Fish and Wildlife Service ends predator poisoning.** *Pest Control 40(3): 28; 1972.*

Partly because of the results contained in the report of the Advisory Committee on Predator Control, released in February 1972, the Department of the Interior has ordered the Fish and Wildlife Service to stop formulating, distributing and using poisons to kill predatory animals on Federal lands. The advisory committee, composed of seven scientists and headed by Dr. Stanley Cain of the University of Michigan, maintained that "large scale use of poisons for controlling predators and field rodents has led to losses of 'non-target' animals that are beneficial and necessary to natural ecological systems." According to Secretary of the Interior Rogers C. Morton, Fish and Wildlife personnel and persons cooperating with them are authorized to continue to protect crops and livestock by using other locally permitted techniques such as trapping, shooting or removal of young. Toxicants now on hand at the Fish and Wildlife Service are being held, and retrieval of bait placed in the field has begun.

72-0914. Pimentel, D. (Dept. of Entomology, Cornell U., Ithaca, NY). **Pesticides and pest control in the future.** *In: Agricultural Wastes: Principles and Guidelines for Practical Solutions, Cornell University Conference on Agricultural Waste Management, Feb. 10-12; 1971. p. 12-14.* (1 reference)

Although pesticides pose a serious pollution problem, they will probably continue to be the major weapon for control of pests in agriculture. The development of species-specific chemicals should eliminate some of the poisoning of non-target species which make up 99% of plants and animals in the U.S. As the price of pesticides increases growers will need accurate cost/benefit evaluations in order to know when it is economical to treat. Although present data suggests that bio-environmental control yields a much greater dollar benefit than pesticides, for biological control and plant resistance much more research is needed than for pesticides. In the future, prescription use of pesticides is likely, classifying them for general public use, licensed use and use only by custom applicators. Advantages of such a program could include: availability and rapid dissemination of pest problem information, verbal instructions on the use of more dangerous chemicals, written guarantees on how a material is to be used, and sale of the exact amount necessary for control.

72-0915. Dewey, J. E.; Pendleton, R. F. (Chemical-Pesticide Program, Comstock Hall, Cornell U., Ithaca, NY). **Guidelines for minimizing pesticide pollution.** *Agricultural Wastes: Principles and Guidelines for Practical Solutions, Cornell University Conference on Agricultural Waste Management, Feb. 10-12; 1971. p. 47-51.*

A checklist is presented of existing methods and materials which would reduce the contribution of agriculture to pesticide pollution if employed. If usefulness is established, careful farm handling of pesticides is imperative. Drift can be prevented by the use of large droplets sprayed as close to the ground as possible when wind is low. Proper placement of crops in relation to houses, streams, animals, sensitive plants, wind direction, run-off patterns and ease of application (to eliminate overlap) also helps minimize drift, and erosion prevention reduces loss through run-off. Wise choice of the chemical and formulation (which may contain thickeners) and proper use are important. Generally, less restricted chemicals are safer. Care in handling and locked, safe, posted storage of containers and equipment, and availability of neutralizing materials are also recommended.

72-0916. Pantaleo, S. (Author address not given). **Il DDT, la sanita e l'ambiente. [DDT, health and the environment.]** *Ig. Sanita Pubb. 27(7-8): 316-319; 1971.* (Italian)

The use of DDT in the battle against malaria is considered indispensable by World Health Organization personnel and other public health experts. In Ceylon, for example, deaths from malaria dropped from 12,587 per year in 1946 to zero in 1961 due to the employment of DDT. When its use was suddenly stopped, 2.5 million new malaria cases appeared, in 1968 and 1969. The use of DDT in marshy regions has made it possible to raise

the standard of living in tropical areas where only subsistence was possible prior to pest control with DDT. No harmful effects of prolonged low-level use have been demonstrated with certainty in man, although damage to other species, notably birds and marine life, is indubitable. The continued cautious employment of DDT in limited areas, especially for spraying around human habitations, should cause minimal further contamination of the environment. Large-scale application to crops is undesirable both from the viewpoint of environmental pollution and due to the development of resistance by insect vectors. Therefore, more readily degradable substitutes for DDT should be sought and used wherever possible, and the use of DDT reserved for those cases in which no effective substitute has yet been found.

72-0917. Anonymous. **La Commissione delle Comunita Europee prepara un programma d'azione in materia di protezione dell'ambiente. [Commission of the European Community prepares an action plan for environmental protection.]** *Minerva Med. 62(suppl.): 9-10; 1971.* (Italian)

In view of the increasing pressures placed on the environment by human population growth and technology, the Commission of the European Community established a working group charged with developing a pan-European environmental protection plan. The Commission felt that such a cooperative plan was needed, since the actions of one country, especially in a crowded geographical situation such as that in Europe, gravely affect another country. The problems to be considered include the increasing quantities of waste materials produced by the rising number of consumers, and contamination of the environment by persistent materials such as some pesticides. The latter include DDT, which now contaminates huge volumes of water and the tissues of living things, including the Antarctic penguin, which lives in a region where DDT was never employed. In addition, DDT, sometimes in combination with other pesticides, has practically interrupted the reproductive cycle of some freshwater fish species.

72-0918. Tsukano, Y.; Kobayashi, A. (National Inst. of Agricultural Sciences, Kita-ku, Tokyo, Japan). **Formation of γ-BTC in flooded rice field soils treated with γ-BHC.** *Agr. Biol. Chem. 36(1): 166-167; 1972.* (6 references)

Previous studies had shown that lindane disappears rapidly from lake bottom mud and rice field soils under flooded conditions, thus suggesting anaerobic degradation. The current investigations revealed the presence of a metabolite which was identified as γ-3,4,5,6-tetrachloro-1-cyclohexane (γ-BTC). The melting point, elemental composition, infrared spectrum and gas chromatographic retention time of this compound, obtained after incubation of lindane in soil, were identical with those reported in the literature. Studies of the incubation of lindane-containing soil under flooded conditions for 6 weeks revealed that 15% of the lindane was degraded at the end of the first week, 39% at the end of the third week, and 90% by the end of the sixth week. Levels of the metabolite γ-BTC gradually increased and then dropped again, the maximum (amounting to about 2% of the quantity of lindane employed) occurring at the end of the second week. The degradation of γ-BTC in flooded soil took place even more rapidly than that of lindane, which may well account for the low γ-BTC levels found in the lindane incubation test.

72-0919. Maul, R. E.; Funk, K.; Zabik, M. E.; Zabik, M. J. (Depts. of Food Science and Human Nutrition and Entomology, Michigan State U., East Lansing, MI). **Dieldrin residues and cooking losses in pork loins.** *J. Amer. Diet. Ass. 59(5):481-484; 1971.* (20 references)

An investigation of dieldrin residues in pork loin roasts and chops was carried out to determine the effect of cooking on the retention of these chemicals in the meat. Two York-Hampshire hogs weighing 340 to 390 lb were fed a total of 14.04 g dieldrin in their normal diet in nine equal doses over a period of 13 days. A control hog received a normal diet. After slaughtering, boneless loin sections were removed and rolled into a roast. Three chops from each animal were removed. After deep freezing at −23°C and thawing at 5°C, time-temperature relationships were continuously recorded during braising, broiling, and roasting. From these data and subsequent analyses, percentages of fat, parts per million of dieldrin, and percentages of cooking losses were determined for boneless pork loin chops cooked by braising, microwave, and broiling and for boneless roasts cooked in a 177°C oven. No significant differences attributable to cooking method were evident in the percentages of fat and amount of dieldrin residues. In general, cooked samples showed lower levels of dieldrin residues than uncooked samples. Residues were present in cooking drip. Ranked in order of increasing percentages of total cooking losses were samples cooked by braising, microwave, roasting, and broiling.

72-0920. Dickes, G. J.; Nicholas, P. V.; Greenslade, R. J. (City and Council of Bristol, Scientific Adviser's Dept., Bristol, England). **Organo-chlorine pesticide residues in tobacco products.** *J. Ass. Pub. Anal. 9: 108-111; 1971.* (5 references)

Organochlorine pesticides *p,p'*-DDE, *o,p'*-DDT, *p,p'*-DDT, *o,p'*-TDE, *p,p'*-TDE, and γ-BHC (lindane) were determined in cigarette, cigar, and pipe tobaccos by gas-liquid chromatography after separation on an alumina column. As a control, recovery tests carried out with known additions of DDT gave recoveries in the 90% region. Results of analyses of 22 cigarettes, 23 pipe tobaccos, and 24 cigars are shown in histogram form. Some French, Russian, and Turkish cigarettes were used, but the bulk were Virginian. Most samples of cigarettes contained less than 30 ppm of total DDT plus TDE with three samples in the range of 40 to 60 ppm. The ratio of TDE to DDT showed some variation in different samples, but generally they occurred in equal proportion. There were no obvious differences in the total DDT plus TDE according to the country of origin. Small concentrations of the order of 0.1 to 0.2 ppm of γ-BHC were found in some samples, and two Turkish samples contained 1 ppm γ-BHC in tobacco. With one exception, pipe tobaccos contained less than 30 ppm of total DDT plus TDE, and most of these were in the range 0 to 10 ppm. It was previously shown that approximately 7% of the total DDT plus TDE in a cigarette is retained in the body of an inhaling cigarette smoker. From this it was calculated that the British cigarette smoker consuming 60 cigarettes per day ingests the same amount of DDT-type compound as from his food.

72-0921. Fechner, G.; Berger, H.; Hoernicke, E. (Institut fuer Veterinaerwesen des Bezirkes Potsdam, 19 Jaegerallee 15, Potsdam, Germany). **Rueckstandsbildung in der Milch nach Trichlorphon-Rueckenwaesche beim Rind. [Residues in milk after back-washing of cattle with trichlorfon.]** *Monatsh. Veterinaermed. 26(22): 858-859; 1971.* (6 references) (German)

Previous studies had indicated that the application of 1 liter of 2% trichlorfon solution in cattle as a backwash for control of *Hypoderma* produced appreciable insecticide residues in the first posttreatment milking. In the current study, cattle were treated by back-washing with 100, 250, or 500 ml of 2% trichlorfon solution. Milk samples were taken after approximately 8, 20, and 32 hr and examined for the presence of trichlorfon and its most toxic metabolite, dichlorvos, using a combined thin-layer chromatographic and enzymatic method. Up to 0.01 ppm trichlorfon was found at the first milking after application of the 250-ml solution, but no dichlorvos; no detectable residues were found at later times at this rate, or at all with the lower dose rate. In the case of the 500-ml application, 0.01 to 0.08 ppm trichlorfon was found at the first milking and 0.005 to 0.02 ppm at the second; up to 0.005 ppm dichlorvos was found only

in the milk from the first milking. These residue levels will not result in trichlorfon (including DDVP) contents in excess of the established tolerance levels after pooling of the milk from morning and evening milkings from several dairies, assuming staggered treatment of the cattle.

72-0922. Moraghan, J. T. (Dept of Soils, Agricultural Experiment Station, North Dakota State U. of Agriculture and Applied Science, Fargo, ND 58102). **Mercury in soil and plant systems: a review of literature.** *N. Dak. Farm Res. 28(4): 53-55; 1971.* (23 references)

The majority of the most recently published data on soil mercury content emanates from working groups in Sweden, Japan, and Great Britain. Data obtained from analyses of 273 Swedish and 14 African soils by Andersson revealed that mercury contents of cultivated soils are generally higher than those of uncultivated soils and that mercury tended to be concentrated in the surface soil. Mercury retention was apparently related to such soil variables as organic matter, clay content, and pH. Aomine and his coworkers in Japan found that phenylmercuric acetate was more strongly adsorbed by clay minerals than mercuric chloride, and that adsorption depended on the pH. Ross and Stewart as well as Lagerwerff postulated that mercuric sulfide formation might be responsible for the gradual inactivation of mercury residues in soil, so that application of lime-sulfur or elemental sulfur might be used to detoxify mercury-contaminated soil. However, the oxidation-reduction conditions in this reaction require further investigation. The relationships between natural mercury levels in soil, water, air, and plants and contamination due to human activities form the subject matter of several reports included in this review.

72-0923. Polizu, A.; Floru, S.; Paulian, F. (Research Inst. for Plant Protection, Bucharest, Rumania). **Absorption, translocation and distribution of lindane and DDT in the corn plant.** *Qual. Plant. Mater. Veg. 20(3): 203-213; 1971.* (17 references)

Following injection of lindane or DDT into corn plants, or absorption of these organochlorine compounds from the soil, these insecticides appeared in the corn kernels after various time intervals. The lindane found in the corn kernels was 1 to 40% of the total quantity taken up by or injected into the plant; the rate at which this insecticide accumulated in the corn kernels was governed by water movement conditions in the plant and the appreciable evaporation of this compound from the plant. Lindane was found to accumulate at the internodes where the corn cobs develop. DDT accumulated much more slowly in the corn kernels, 0.02% of the amount injected being detected in the kernels harvested 5 days after injection, and 0.1 to 0.4% in those harvested 45 days after injection. DDT was taken up from the soil, but only in trace amounts; it is possible that irrigation, with increased water flow in the plant, would accelerate transport to and deposition in the kernels.

72-0924. Polizu, A.; Greger, H.; Alexandri, A. V. (Research Plant Protection Inst., Bucharest, Rumania). **Studies on the persistency of carbaryl residues in fruit.** *Qual. Plant. Mater. Veg. 20(3): 215-220; 1971.* (8 references)

Carbaryl is used in Rumania for control of some fruit tree and vegetable pests. In the current study, the losses of carbaryl from peaches, apples and plums after spraying during fruit maturation were investigated. The initial toxicant deposit varied from 8 to 15 ppm on peaches, 1 to 4 ppm on apples and 0.8 to 2.2 ppm on plums. Residue loss was accelerated by rainfall during the 4 to 7 day interval after application. The residues on peaches declined to below 5 ppm in about 10 days and to 2 ppm in 15 to 20 days; below 2 ppm in 7 days on apples; and to 1 ppm in 3 to 4 days on plums.

72-0925. Milhaud, G.; Bechade, A.; Pinault, L. (Chaire de Pharmacie-Toxicologie, Ecole Nationale Veterinaire, 94-Alfort, France). **Contamination du lait par des residus de Ronnel et de Malathion utilises pour la desinsectisation des etables. [Contamination of milk with residues of ronnel and malathion used for disinsection of stables.]** *Rec. Med. Vet. 147(10): 1053-1061; 1971.* (11 references) (French)

The banning of organochlorine insecticides for use in animal quarters necessitated investigation of other insecticides, such as the organophosphates. In the present investigation, four cowsheds housing 7 to 10 cows each were disinsected and disinfected by the standard method of the Loiret Veterinary Service, using a whitewash composition containing a 30% solution of kaolin, 2.64 g/l ronnel and 5.45 g/l malathion. After drying, the walls were rinsed with a 5% cresol solution to avoid direct contact of the animals with the insecticides. Cattle were readmitted to the treated barns 1 or 7 hours after treatment; milk samples were taken immediately or 7 hours later, then for up to 90 days. Residue levels in milk fat were determined by gas chromatography. Highest levels of both insecticides were found within the first three days after disinsection; in many cases, the initial value (sample collected at 0 or 7 hours after beginning of exposure) was the highest. The maximum values found for ronnel were between 0.11 and 0.20 ppm; for malathion, 0.08 to 0.28 ppm. A continuous decrease was noted after the third day, but traces were still detectable in some samples for up to 60 days. The ronnel residues found were always below the 0.04 ppm level in whole milk, which has been established as the

tolerance in France. The high levels found immediately upon admission of the cows into the barn and in the afternoons (after the cows had been in pasture all day) pointed toward the possibility of direct contamination of the milk by insecticides present in the atmosphere. Small quantities of materials identified as BHC , heptachlor epoxide, endosulfan and DDE detected in all milk samples were presumed to have originated in the cattle feed.

72-0926. Smith, A. E. (Coll. of Agriculture Experiment Station, U. of Georgia, Experiment, GA 30213). **Influence of calcium hydroxide and sulfur on 2,4-D degradation in soil.** *Soil Sci. 113(1): 36-41; 1972.* (20 references)

Cecil sandy loam soil collected from a pasture of primarily bermudagrass and broomsedge, which had not been grazed or fertilized for the previous 5 years and therefore represented reasonably stable soil conditions was used in the experiments. Addition of 0 to 4000 ppm of sulfur and calcium hydroxide to sterilized soil had very little influence on the nonbiological degradation of 2,4-D. Acidic soil conditions did not influence the nonbiological degradation of the herbicide. Herbicide degradation was significantly greater in soils treated with calcium hydroxide than in untreated soil. Soil pH values remained slightly above 7, approximately 0.4 pH units higher than that of untreated soil. Higher concentrations of calcium hydroxide significantly decreased 2,4-D degradation in soil with the greatest influence on degradation occurring at the 4,000 ppm rate. Sulfur additions to nonsterilized soil samples resulted in pronounced effects on biological degradation of 2,4-D. Low pH values were directly correlated with decreases in herbicide degradation. 2,4-D was broken down faster in neutral to slightly alkaline conditions in Cecil sandy loam soil.

72-0927. Drescher, N.; Schiweck, H. (Landwirtschaftlichen Versuchsstation Limburgerhof der BASF, Limburgerhof, Germany). **Das Verhalten von Pyrazon und seinen Metaboliten waehrend der Vegetation und Verarbeitung von Zucherrueben. [Behavior of pyrazon and its metabolites during growth and processing of sugar beets.]** *Zucker 24(19): 500-503; 1971.* (8 references) (German)

Two metabolites of pyrazon have been demonstrated to occur in soil and in sugar beets following application of this herbicide, and studies were performed on the quantities of pyrazon taken up and metabolized by sugar beets after pre- or post-emergence application. Since these studies showed that only metabolite B (4-amino-5-chloropyridazone-6) was still present in the beet root at the time of harvest, and not pyrazon itself or metabolite A (pyrazon-*N*-glucoside), the appearance of this metabolite in the various sugar processing fractions was followed. After diffusion, about 10% of metabolite B remains in the exhausted cossettes, whereas about 90% passes into the raw juice. The metabolite remains unaltered during the carbonation and crystallization steps, and passes into the molasses. Co-crystallization of this metabolite with the sugar did not occur, and thus the consumer product was free from pyrazon-derived contamination. The quantity of metabolite B in the molasses and dry pulp was low enough to be considered as toxicologically harmless when used as animal feed.

72-0928 Fusi, P.; Franci, M. (Istituto di Chimica Agraria e Forestale dell'Universita di Firenze, Florence, Italy). **Sulla persistenza di atrazina nei terreni sterili e non sterili a vario grado di umidita. [Persistence of atrazine in sterilized and non-sterilized soils at various moisture levels.]** *Agrochimica 15(6): 557-563; 1971.* (21 references) (Italian)

The influence of moisture on the persistence of atrazine in sterilized and unsterilized soils was investigated by adding 4 ppm of this herbicide to samples of a clay-limestone soil, a sandy soil and a soil with high organic matter content. Samples from each group were maintained at 10%, 50%, or 100% of the moisture-retaining capacity (humidity) of the soil, and analyzed for atrazine content after 1, 9, 18, and 36 days. As was expected, the greatest degradation of atrazine (resulting in 20 to 30% recovery after 36 days) occurred in nonsterilized soils at 100% humidity. About 50 to 60% was recovered from the sterilized soil at 100% humidity after 36 days. At the 10% humidity level, the 36-day recovery value was 40 to 50% for nonsterile and 60 to 70% for sterile soils. Recovery from all soil types after only one day of incubation averaged 88%, except in the case of the high-organic soil, where the average was 75%. Recovery rates in general were lower in the high-organic soil, possibly due to the high adsorptive capacity of such soil. Both microbiological and chemical factors seem to be significantly involved in the degradation of atrazine in soil.

72-0929. Soedergren, A.; Svensson, B.; Ulfstrand, S. (Dept. of Animal Ecology, Ecology Bldg., S-223 62 Lund, Sweden). **DDT and PCB in South Swedish streams.** *Environ. Pollut. 3(1): 25-36; 1972.* (27 references)

The distribution and occurrence of organochlorine compounds in streams in southern Sweden was examined, using the amphipod *Gammarus pulex* as the main indicator organism because of its widespread occurrence. Covariance occurs between total DDT and PCB (polychlorinated biphenyl) residue levels, despite their different mechanisms of dispersal into the environment. Comparison of residue levels among invertebrate species and other sources (e.g., stream detritus) was made difficult by the fact that organochlorine residue levels generally parallel lipid contents, so that the comparison should actually be based on the amount of pesticide per unit of lipid. For example, the quantity of total DDT

plus PCB in a *Gammarus pulex* population in one stream decreased from 0.9 to 0.02 ppm on a wet weight basis between September and March of one year, but increased from less than 0.01 ppm to almost 0.04 ppm on the basis of lipid weight. Possible transport routes and accumulation processes for various plant mollusk, insect, and fish species are discussed.

72-0930. Goursaud, J.; Luquet, F. M.; Boudier, J. F.; Casalis, J. (Laboratoire du Lait, Ecole National Superieure des Industries Agricoles et Alimentaires, Douai, France). **Sur la pollution du lait par les residus d'hexachlorobenzene (HCB). [Contamination of milk with hexachlorobenzene residues.]** *Ind. Aliment. Agr. 89(1): 31-35; 1972.* (5 references) (French)

A systematic search for pesticide residues in milk collected by a large dairy concern in northern France revealed that milk from certain collection stations was constantly contaminated with a rarely encountered compound, subsequently identified as hexachlorobenzene (HCB). Farms supplying milk to the collection stations involved were those on which endive was also grown, and the roots fed to cattle. Of the various pesticides employed in endive culture, only commercial preparations of the fungicide pentachloronitrobenzene (PCNB) could conceivably represent the source of hexachlorobenzene. Endive leaves and roots were found to contain both HCB and PCNB (at 0.01 to 2.81 and 0.06 to 83.0 mg/kg respectively). Milk from cows receiving the roots as a feed supplement contained 0.04 to 26.0 mg/kg of HCB, along with other organochlorine pesticides, but no PCNB. The commercial formulation used for antifungal treatment of endive plants contained 30% PCNB and 3% HCB; it remains to be established whether this level of contamination is sufficient to account for all of the HCB found in the milk. Experimental administration of diets containing 2 mg/day HCB and 25 mg/day PCNB to milk cows resulted in progressive increases in the HCB content of the milk, which reached 2 ppm on the seventh day. Only traces of PCNB were found in the milk.

72-0931. Corneliussen, P. E. (Sciences Br., Off. Exec. Dir. Regional Op., Food and Drug Admin., U.S. Dept. HEW, Rockville, MD 20852). **Pesticide residues in total diet samples (VI).** *Pestic. Monit. J. 5(4): 313-330; 1972.* (12 references)

Pesticide residue levels detected in ready-to-eat foods remained at relatively low levels during the sixth year of the Total Diet Study in its present form. Samples were collected from 30 markets in 28 different cities. Population of cities ranged from less than 50,000 to 1,000,000 or more. Averages and ranges of pesticides commonly found are reported for the period June 1969 to April 1970 by region and food class. Pesticides found infrequently also are reported for this period by region and food class. Data showing loss of residues through cooking and processing of food are presented. Results of recovery studies with various classes of pesticides are also presented. (Author abstract by permission.)

72-0932. Duggan, R. E.; Corneliussen, P. E. (Off. Assoc. Commissioner for Compliance, Food and Drug Admin., U.S. Dept. HEW, Rockville, MD 20852). **Dietary intake of pesticide chemicals in the United States (III). June 1968-April 1970.** *Pestic. Monit. J. 5(4): 331-341; 1972.* (18 references)

Results are presented of the continuing study of dietary intake of pesticide chemicals on samples collected in 1969 and 1970. These results are compared with those obtained during the first 4 years of the study. Comparison showed that daily intake of DDT analogs declined significantly while aldrin-dieldrin levels were unchanged. Geographical differences were significant. The pesticide residue levels found were lower than the established acceptable daily intakes. (Author abstract by permission.)

72-0933. Sand, P. F.; Wiersma, G. B.; Landry, J. L. (Plant Protection Div., Agr. Res. Serv., U.S. Dept. Agr., Hyattsville, MD 20782). **Pesticide residues in sweetpotatoes and soil - 1969.** *Pestic. Monit. J. 5(4):342-344; 1972.* (6 references)

Paired soil and sweetpotato samples were gathered from 92 sites in 9 major sweetpotato-producing States. The average residue levels in sweetpotato soils for DDTR (DDT + TDE + DDE), chlordane, and dieldrin were 1.19, 0.28, and 0.17 ppm, respectively. In sweetpotatoes, average pesticide residue levels were generally below 0.01 ppm; DDTR was present in 28.3% and dieldrin in 18.5% of the sweetpotato samples. (Author abstract by permission.)

72-0934. Wiersma, G. B.; Mitchell, W. G.; Stanford, C. L. (Pestic. Reg. Div., Offic. Pestic. Programs, EPA, Washington, DC 20460). **Pesticide residues in onions and soil - 1969.** *Pestic. Monit. J. 5(4): 345-347; 1972.* (1 reference)

Paired soil and onion samples from 71 commercial growing sites in 10 major onion-producing States were examined for pesticide residues by gas-chromatographic analysis. DDTR (DDT + TDE + DDE) had the highest average in the soils, 15.10 ppm. The next two highest averages in the organochlorine class were chlordane, 1.63 ppm; and dieldrin, 0.79 ppm. The highest organophosphate levels were those for ethion, 1.23 ppm; and ethyl parathion, 0.22 ppm. The order of frequency of occurrence generally paralleled the order according to residue levels within the pesticide groups. Residues of the herbicide DCPA (Dacthal) were found in 46.5% of the soil samples at an average level of 0.94 ppm. Despite the high residue levels found in many of the soils, no pesticide residues were detected in the onion samples analyzed.

72-0935. Pakkala, I. S.; White, M. N.; Burdick, G. E.; Harris, E. J.; Lisk, D. J. (Pesticide Residue Lab., Dept. of Entomology, N.Y. State Coll. of Agriculture, Cornell U., Ithaca, NY 14850). **A survey of the lead content of fish from 49 New York State waters.** *Pestic. Monit. J. 5(4): 348-356; 1972.* (23 references)

An analytical survey was made of the total lead content of 419 fish of various species sampled in 1969 from 49 New York State waters and a group of lake trout sampled in 1970 from Cayuga Lake only. Most often, lead concentrations ranged from 0.3 to 1.5 ppm, but a few samples contained levels up to 3 ppm. Fish from certain waters including Lakes Canadice, Canadaigua, Erie, Hemlock, Pleasant, and Raquette and the Hudson River showed higher lead levels more consistently than fish from other waters. No correlation was noted between lead concentration and the size, species, or sex of fish, and lead did not appear to be cumulative in the lake trout of known age up to 12 years from Cayuga Lake. (Author abstract by permission.)

72-0936. Ogg, Jr., A. G. (Plant Sci. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Irrigated Agr. Res. and Extension Center, Prosser, WA 99350). **Residues in ponds treated with two formulations of dichlobenil.** *Pestic. Monit. J. 5(4): 356-359; 1972.* (5 references)

Residue levels of dichlobenil in pond water and hydrosoil were compared after field applications of wettable powder and granular formulations to separate ponds at 10.0 lb/surface acre (0.6 ppmw, parts per million by weight, in the water). Water and hydrosoil samples were taken from each pond 1 day after treatment and periodically thereafter. Maximum residual concentrations in the water, reached 4 and 5 days after treatment with wettable powder and granules, respectively, were 1.00 and 0.68 ppmw. After 15 days, the residual concentrations were approximately the same and both decreased steadily to the detection limit of 0.001 ppmw after 126 days (last sampling date). The maximum concentration of dichlobenil in the hydrosoil was 1.472 ppmv, parts per million by volume, 6 days after treatment with wettable powder and 3.700 ppmv 1 day after treatment with the granules. Residues in the hydrosoil of the two ponds did not reach similar levels until 34 days after treatment. The residual concentrations from the wettable powder and granular treatments had decreased to 0.039 and 0.025 ppmv, respectively, 126 days after treatment. The persistence of dichlobenil in pond water and hydrosoil was similar whether applied as a granular or a wettable powder formulation. (Author abstract by permission.)

72-0937. Messer, J. W.; Lovett, J.; Murthy, G. K.; Wehby, A. J.; Schafer, M. L.; Read, Jr., R. B. (U.S. Dept. of HEW, Public Health Service, Bureau of Foods, FDA, Division of Microbiology, Cincinnati, OH 45226). **An assessment of some public health problems resulting from feeding poultry litter to animals. Microbiological and chemical parameters.** *Poultry Sci. 50(3): 874-881; 1971.* (14 references)

Samples of poultry feed and litter were assayed for arsenic, uric acid, furazolidone, nitrofurazone, UV-activated substances, and DDT+DDE. In preliminary studies, recovery and reproducibility were satisfactory except in the cases of zoalene and diethyl stilbestrol, DES (a UV-activated substance). All samples assayed showed no detectable zoalene, and only 2 litter samples could be considered positive for UV-activated substances. In general, concentrations of the compound present were low. Samples from 5 farms were tested for arsenic and UV-substances and only one farm had a high level of arsenic (70.8 to 76.6 mg/kg) in the litter. On the farm whose samples were tested for furazolidone, an initially high feed content of 142.5 mg/kg resulted in levels of about 12 mg/kg in the litter. Heat, ethylene oxide and ^{60}Co radiation were tested as methods of sterilization of the litter at the same time. Although a heat process would be feasible for elimination of disease transmission, the possibility of higher levels of pesticides and drugs and the unknown effects of continuous exposure to low levels suggests that the ban on interstate shipment of poultry litter for animal feed should be retained.

72-0938. Stoltenberg, D. H. (U.S. Environmental Protection Agency, Evansville, IN). **How to reclaim a poisoned lake.** *Pub. Works 103(3): 59-61; 1972.* (2 references)

The removal of endrin, found in concentrations as high as 15 ppb, from a 3-acre lake near Portsmouth, Ohio, following a deliberate dumping of about one-half gallon of a mixture of endrin and strychnine, was achieved by filtration through activated carbon. The spillway was sandbagged and incoming water was diverted around the lake. Following successful laboratory and pilot scale filtrations, the upper 5 ft of the lake, where endrin had stratified, was pumped into the spillway through an upflow filter of Calgon Filtrasorb 400 activated carbon. An electric submersible pump dosed the filter at 170 gpm and resulted in a consistently satisfactory effluent containing approximately 0.1 ppb endrin. The pumping was complicated by periodic heavy rainfall, infiltration and power failure. After lowering the water level 5 ft, the lake was drained and exposed sediments, containing carbon which had been spread on the surface as an initial measure, were dredged out and buried.

72-0939. Businelli, M.; Tafuri, F.; Scarponi, L. (Istituto di Chimica Agraria dell'Universita di Perugia, Perugia, Italy). **Riduzione dei residui di cloruro di clorocolina in fragole e pomodori mediante nuove tecniche di trattamento. [Reducing choline dichloride residues in strawberries and tomatoes by means of new treatment procedures.]** *Rass. Chim. 22(1): 9-11; 1970.* (7 references) (Italian)

When CCC (chlormequat chloride) was applied to tomatoes and strawberries at various stages of their development, utilizing a variety of procedural techniques, substantial decreases in residual CCC were achieved. Pesticide residues in tomatoes ranged between 4.5 and 7.3 ppm when 4 treatments with 1,500 or 3,000 ppm solutions were applied starting from the blooming stage. These residues dropped to 0.12 to 1.80 ppm when 2 applications with pesticide solutions of 1,000, 1,250, or 1,500 ppm were applied. According to the initial procedure, strawberries were treated with 8×10^3, 16×10^3 or 24×10^3 ppm of pesticide solutions, while the flower petals were still closed, and CCC residues in the mature fruit ranged from 0.5 to 9.1 ppm. Applications with 3×10^4, 4×10^4 or 5×10^4 ppm concentrations, performed one year after harvest, achieved a drop below detection level (0.005 ppm) in CCC residues found in the new harvest. In addition to decreased pesticide residues, the new treatment procedures provided a range of qualitative and agricultural improvements to the harvested product.

72-0940. Raskin, M. A. (Regional Lab. of Veterinary Medicine, Chernovtsy, USSR). **O profilaktike nakopleniya pestitsidov v kormakh. [Prevention of pesticide accumulation in feed.]** *Veterinariya 47(6): 87-88; 1971.* (Russian)

The use of chemicals in farm production is discussed. The necessity for continuous checking of proper use of pesticides and of regular laboratory analysis of feed and food products for pesticide content are stressed. Some preventive measures for protection of feed, animals, and food industry products against poisoning by herbicide residues include: proper storage of pesticides, discontinuation of chemical treatment of fields 1-2 months before harvest, and use of pesticides persisting in soil (polychloropinene, hexachlorane [BHC]) in early spring only. Since DDT was shown to remain in soil for a longer period of time, the feed has to be analyzed for its content even if soil has not been treated with DDT recently. Because of that and because of its high toxicity, the substitution of a less toxic pesticide than DDT is recommended.

72-0941. Reichenbach-Klinke, H. H.; Negele, R. D. (Zoologisches und Parasitologisches Institut der Tieraertzlichen Fakultaet der Universitaet Muenchen, Munich, West Germany). **Rueckstandsuntersuchungen an Fischen. [Residue analysis in fish.]** *Z. Wasser Abwasser Forsch. 5(1): 25-28; 1972.* (16 references) (German)

Fish have been examined by various authors for residues of heavy metals (e.g., copper sulfate, mercury), pesticides (trichlorfon), phenols and antibiotics. The characteristic areolas around the nerve cells of the spinal cord first observed by Kayser *et al.* in 1962, which are due to pesticide pollution, were found in fish examined subsequently. According to a study by Gakstatter (1968), exposure of goldfish to 0.05 ppm ^{14}C-aldrin for eight hours resulted in an accumulation of more than 20 ppm in the fatty tissue, and no signs of degradation were noted even months after exposure; nerve cells, too, tend to retain the pesticide concentration, once attained, for long periods of time. Spinal cord, brain, blood, kidneys, and liver began to degrade the pesticide after exposure. In the spinal cord, somewhat more than 14 ppm had accumulated, which fell to 8 ppm after 8 days; the liver had accumulated 5 ppm, which decreased to a little less than 2 ppm after 8 days. In muscle, the concentration went up to nearly 2 ppm, and had dropped back to 1 ppm after 8 days. The kidneys reduced the accumulated concentration of about 4 ppm to about 1 ppm.

72-0942. Suvak, L. N. (Dept. of General Hygiene of the Kishinev Medical Inst., Kishinev, USSR). **O nositel'stve DDT naseleniyem Moldavii. [DDT in the inhabitants of Moldavia.]** *Zdravookhranenie 13(1): 20-22; 1970.* (8 references) (Russian)

A survey of DDT contents in 269 persons, none of whom had occupational contact with pesticides, was conducted in Moldavia, where DDT has been widely used. In a previous investigation, 50% of the soil samples, 25% to 40% of the animal products and 7% of the water samples analyzed were found to contain DDT, generally in amounts below the maximum allowable concentrations. In the present study, the samples, obtained by necropsy and biopsy, indicated that about 95% of Moldavian residents were DDT carriers, and 77%, DDE carriers. The average DDT and DDE contents in adipose tissues were 2.03 and 2.20 mg/kg; and in the omentum, 1.95 and 1.92 mg/kg respectively. DDT and DDE residues were found in the adrenal glands of 39% of the subjects studied in average quantities of 1.32 and 1.54 mg/kg tissue, and in the livers of 20% of those studied, at 0.74 and 0.91 mg/kg respectively. Traces of these pesticides were found in lungs, kidneys and other organs, but not in the heart.

72-0943. Mossel, D. A. A.; Gruen, L. (Centraal Instituut voor Voedingsonderzoek TNO, Zeist, The Netherlands). **Hygienische Anforderungen an Saeuglingsnahrung. [Hygienic requirements in the feeding of infants.]** *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. 1: Orig. Reihe B 155(2): 103-116; 1971.* (120 references) (German)

Raw milk samples obtained from various dairy farms which supply milk for the preparation of canned formula were examined for the presence of bacteria, bacteriostatic substances and pesticides. A generally high level of purity was found: bacterial counts were uniformly low, and no antibacterial activity was demonstrated. The pasteurized samples remained sterile after storage for one month, and the vitamin contents were maintained. The pesticide residue determinations, performed according to the AOAC method, yielded

values below 10^{-3} μg/ml for BHC, lindane, heptachlor, heptachlor epoxide, aldrin, dieldrin, endrin, DDE and DDD (TDE). The value for DDT was below 2×10^{-3} μg/ml. These values are about 2 orders of magnitude lower than the levels recently found in human breast milk, which were approximately $10\text{-}250 \times 10^{-3}$ μg/ml.

72-0944. Voytekhova, V. A. (Dolgoprudnaya Agrochem. Operative Station, Ya. V. Samoylov Res Inst. of Fertilizers, Insecticides and Fungicides, USSR). **O pogloshchenii gerbitsidov pochvoy. [The absorption of herbicides by soil.]** *Agrokhimiya 9: 102-110; 1969.* (10 references) (Russian)

The dynamics of triazine herbicide (atrazine, simazine, and atratone) absorption by soil samples of different agrochemical natures was studied. The amount of soil-absorbed herbicide was determined from its herbicidal action under conditions of decreasing soil weight. All of the investigated soil samples exhibited 70 to 99.4% herbicide absorption under optimum plant growth conditions. The degree of herbicide absorption was dependent on the fluid/solid soil phase ratio: increased amounts of soil humidity (i.e., increasing herbicide solution volumes with concentrations constant) per solid soil unit decreased the relative herbicide absorption. Absorption of herbicides by the soil samples was also dependent on the chemical structure of the herbicide. Thus, absorption of atrazine decreased with the concentration of its solutions while absorption of simazine appeared to be independent of the concentration of its solutions; absorption of atratone was directly dependent upon soil acidity. Decreased soil humidity enhanced the fixation of the herbicide within the soil sample.

72-0945. Debelyy, A. S.; Troshko, Ye. V.; Baginskaya, G. P. (All-Union Research Inst. of Pharmaceutical Plants, Moscow Reg., USSR). **Opredeleniye ostatochnykh kolichestv 2,4-D v syr'ye valer'yany lekarstvennoy. [Determination of residual amounts of 2,4-D in common valerian.]** *Agrokhimiya 10:94-98; 1969.* (4 references) (Russian)

Treatment of valerian herb fields with 2,4-D results in practically complete decontamination at harvest if sodium salt derivatives are applied at a 1.5 to 2.0 kg/ha dose, amino-salt derivatives are used in 2.0 to 2.5 kg/ha doses or butyl ester derivative is used in a 0.7 kg/ha dose. Largest amounts of 2,4-D accumulate in the roots (0.96 mg/kg air dry matter) 30 days following application of herbicide when applied during the second year of culture during the vegetative period. This amount decreases to 0.63 mg/kg 70 days after application. Residues are found on leaves 10 to 30 days following its application. No traces of herbicide are found in alcoholic root infusions, even if the dry matter had some residues, which may be due to the fact that only free 2,4-D is solubilized. Analytical procedure for 2,4-D was based on its dealkylation to 2,4-dichlorophenol by treatment with pyridine hydrochloride and extraction with a 0.2% NaOH solution. The pink color generated by the dealkylated herbicide upon treatment with 4-aminoantipyrine was measured at $\lambda = 515$ nm.

72-0946. Astolfi, E.; Blaksley, J.; Rabinovich, A.; Becker, D.; Pineda, E. (Author address not given). **Plaguicidemia en la Republica Argentina. [Blood pesticide levels in Argentina.]** *Arch. Argent. Pediat. 68: 20-22; 1970.* (Spanish)

In order to evaluate the level of environmental contamination by organochlorine insecticides in Argentina, blood samples obtained from children between one and ten years of age were sent to the University of Miami for analysis. All of the samples contained β-BHC at 1.3 to 22 ppb and *p,p'*-DDE at 1.7 to 22 ppb, and the majority contained lindane, heptachlor epoxide, dieldrin and *o,p'*-DDT at 0.1 to 1 ppb and *p,p'*-DDT in the 1 to 8 ppb range. These Argentinian samples contained slightly less of the DDT-derived compounds and slightly more of the BHC-heptachlor group than comparable samples from the U.S. These findings agree approximately with those obtained on adult adipose tissue samples in Argentina in 1967, and point out the need for further development of pesticide studies, a nucleus for which already exists at the Medical Faculty of Buenos Aires.

72-0947. Vermeer, K.; Reynolds, L. M. (Canadian Wildlife Service, Edmonton, Alberta, Canada). **Organochlorine residues in aquatic birds in the Canadian prairie provinces.** *Can. Field-Nat. 84(2): 117-130; 1971.* (24 references)

Seventy composite samples of aquatic bird eggs were collected in Alberta and Saskatchewan during the egg-laying and incubation periods of 1968, and 30 composite samples of eggs were collected in Saskatchewan and Manitoba in 1969. Individual egg samples were also taken in 1969 from common terns, double-crested cormorants and great blue herons; all were analyzed for organochlorine pesticide residues, and shell thickness was examined in the heron eggs. DDT and DDD residue levels were not included in the tabulated data, since these values could not be determined reliably without PCB separation. The DDE and dieldrin levels in eggs of gulls and fish-eating birds were higher than those in geese and ducks; they ranged from about 0.1 to 20 ppm for DDE; from 0.01 to 1.5 ppm for dieldrin; from 0.01 to 0.9 ppm for heptachlor epoxide (including some heptachlor at the highest levels); and from 0.01 to 0.3 ppm for β-BHC. Residue levels in the eggs were closely correlated with those in the livers of female birds at the time of egg-laying. Shell thickness was significantly (inversely) correlated with DDE concentration in the great blue heron eggs, but not with PCB concentration.

72-0948. Vrochinskiy, K. K. (All-Union Research Inst. for Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **O nakoplenii pestitsidov v gidrobiontakh. [Accumulation of pesticides in the hydrobiont.]** *Gidrobiol. Zh. 6(4): 126-131; 1970.* (35 references) (Russian)

The organochlorine pesticide contamination of the hydrobiological environment is reviewed. The world literature has attributed numerous fish kills to organochlorine contamination of rivers and lakes. Accumulation of organochlorine residues in the hydrobiological system may provide a portal of entry into marine and terrestrial food chains, and eventually result in contamination of the world environment. Some life forms may concentrate organochlorine residues. For example, application of DDT in mineral oil emulsion to a Siberian river for mosquito larva control gave a resultant DDT concentration of 0.013 mg per liter of water. The DDT concentration in the riverbed silt averaged 0.20 ppm; in water plants, 1.41 ppm; and in fish visceral fat, 18.85 ppm. The corresponding DDE concentrations were 0.07, 0.31 and 30.0 ppm, and TDE averaged 0.01, 0 and 6.31 ppm respectively. These results are similar to those obtained by American investigators in Lake Miller and Lake Davis, where toxaphene was used to destroy organisms incompatible with fish. Organochlorine insecticide residues are now found in regions remote from any areas of application.

72-0949. Kamil'dzhanov, A. Kh.; Khasanov, Yu. U. (Uzbek Research Inst. of Sanitation, Hygiene and Occupational Diseases, Tashkent, USSR). **Ob ostatochnykh kolichestvakh fozalona v obrabotannykh im yablokakh i lyutserne. [Phosalone residues in apples and alfalfa.]** *Gig. Sanit. 36(6): 104-105; 1971.* (2 references) (Russian)

The dynamics of phosalone residues in apples and alfalfa were investigated. Gardens were treated with 3 kg/ha of pesticide (0.15% solutions) during the vegetative stage. Largest residual amounts (0.385 mg/kg apples) were found on the day following treatment; minimum residues (0.015 mg/kg) were found 46 days later. Alfalfa fields were treated with 1.5 kg/ha of insecticide. Largest residual amounts of phosalone (0.23 mg/kg raw matter) were found 10 days following treatment and lowest figures (0.041 mg/kg) were found 30 days following treatment. Upon mowing and drying, samples analyzed 10 days following treatment had 0.1 mg/kg (dry matter) residues which decreased to half of this amount 20 days after treatment; no residues were found 30 days after application of the insecticide.

72-0950. Slatov, I. V.; Uporova, G. I.; Shtyler, S. Yu. (Smolensk Regional Sanitary and Epidemiological Station, Smolensk, USSR). **Ostatki DDT i GKhTsG v pishchevykh produktakh. [DDT and HCCH (BHC) residues in food products.]** *Gig. Sanit. 36(8): 117; 1971.* (Russian)

Grass and tuberous feed cultures subjected to single treatment with a 12% preparation of BHC or to three treatments with 30 kg/ha of BHC revealed no residues of the pesticide upon harvest. Soil samples contained five to ten times the amount of BHC following harvest as compared to the figures found before application of the pesticide. Samples of beef and dairy products analyzed at the Smolensk meat and dairy processing factories contained DDT and BHC residues. Further studies as to the source of contamination are in progress.

72-0951. Chichikalo, D. I.; Popov, L. G.; Gavryuk, A. P.; Potapenko, V. M. (Cherkassy Regional Sanitary and Epidemiological Station, Cherkassy, USSR). **Gigiyenicheskoye obosnovaniye srokov vykhoda na rabotu na polya, obrabotannyye polikhlorkamfenom. [Hygienic substantiation of the period of time after which work is permissible on fields treated with polychlorocamphene.]** *Gig. Sanit. 36(10): 104-105; 1971.* (5 references) (Russian)

Laboratory and field tests were carried out to determine the period of time after which polychlorocamphene (toxaphene) concentrations in air, soil, and plants are reduced to harmless values. Amounts of 2 and 6 kg/ha were sprayed on sugar beet fields after the background concentration was determined. Concentrations of 19.7 to 5.9 mg/cm^3 and 0.8 mg/cm^3 were found in the air during the first four days, and on the fifth day after three sprays, respectively. The concentration fell below the threshold value on the tenth day. In soil and plant samples taken on the first, third, and seventh day after treatment, polychlorocamphene contents of 2.7 mg/kg, 0.9 mg/kg, 0.3 mg/kg, and 3.3 mg/kg, 3.0 mg/kg, 0.5 mg/kg were found, respectively. Due to the relatively high stability of polychlorocamphene, work should not be permitted on fields treated with this product until after the tenth day.

72-0952. Kozhinova, L. A.; Grigor'yeva, T. I.; Yurasova, O. I. (A.N. Sysin Inst. of General and Communal Hygiene of the USSR Academy of Medical Sciences, Moscow, USSR). **Eksperimental'nyye dannyye o proniknovenii geksakhlorana v pochvu. [Experimental data on hexachlorane penetration into the soil.]** *Gig. Sanit. 36(11): 47-49; 1971.* (10 references) (Russian)

The hazards of ground water contamination by hexachlorane (BHC) were investigated in laboratory and field experiments performed on chernozem soils. Laboratory studies were carried out in special columns treated with 2 kg/ha of ^{14}C-labeled BHC. The relative distribution of the insecticide appeared to be almost identical in the two experiments, 4 months after application. The 0 to 8 cm layer contained 89% of the applied pesticide, and the 8 to 16 cm layer, 2%. Traces of BHC were found to a depth of 50 cm in petroleum ether-extracted samples. Field experiments (sugar-beet cultures) with 5 kg/ha BHC applied in May showed 93% of the prepara-

tion to occur within the 0 to 10 cm layer and 3.5 to 4.5% within the 25 cm layer, 5 months following application. There appears to be no danger of ground water contamination if BHC is used according to the recommendations of the USSR Ministry of Agriculture.

72-0953. Elkins, R. E.; Farrow, R. P.; Kim, E. S. (National Canners Association, Washington, DC 20036). **The effect of heat processing and storage on pesticide residues in spinach and apricots.** *J. Agr. Food Chem. 20(2): 286-291; 1972.* (18 references)

Spinach and apricots were fortified separately with 15 commonly used pesticides representative of chlorinated hydrocarbons, organophosphates, and carbamate compounds. Fortified samples were analyzed before and after a representative heat treatment and after storage 1 yr at ambient and 100°F temperatures. With the exception of Captan and Diazinon, pesticides in all three classes of compounds exhibited some degree of stability during the initial heat treatment given apricots. The heat treatment given apricots was less than that given spinach and this may be responsible for at least some of the apparent stability. Under the storage conditions of the study, the carbamate pesticides appear to be quite stable in an acid product but not in low-acid product. Organophosphate pesticides were lost in both products tested, while chlorinated hydrocarbon stability seemed to depend on the compound itself. In nearly all cases, storage at 100°F for 1 yr resulted in an additional loss of pesticide. In the case of the carbamate compounds, however, no additional loss was noted in apricots during these storage conditions. (Author abstract reprinted by permission of the American Chemical Society.)

72-0954. Ritchey, S. J.; Young, R. W.; Essary, E. O. (Dept. of Human Nutrition and Foods, Virginia Polytechnic Inst. and State U., Blacksburg, VA 24061). **Effects of heating and cooking method on chlorinated hydrocarbon residues in chicken tissues.** *J. Agr. Food Chem. 20(2): 291-293; 1972.* (11 references)

Lindane, endrin, heptachlor, dieldrin, and aldrin were fed at 10 ppm to broilers throughout an 8-week growing period. Tissues from these birds were cooked by baking, frying, or steaming and were heated in closed containers for 30, 60, and 90 min. Residues, calculated on a dry matter basis, were lowered during cooking but the reduction in concentration was not significant in most cases. Lindane concentration was reduced considerably when tissues were heated in closed containers. Heptachlor epoxide was lowered during heating, but the amounts of endrin, dieldrin, and aldrin were not reduced. Losses of these residues occurred primarily by leaching with fat and water, although there was some destruction of lindane and heptachlor epoxide by heating. (Author abstract reprinted by permission of the American Chemical Society.)

72-0955. Glass, B. L. (U.S. Soils Lab., Soil and Water Conservation Research Div., Agricultural Research Service, USDA, Beltsville, MD 20705). **Relation between the degradation of DDT and the iron redox system in soils.** *J. Agr. Food Chem. 20(2): 324-327; 1972.* (18 references)

Four soils varying in organic matter and free iron contents were treated with DDT at 200 ppm, amended with the enzyme urease, and waterlogged at 35°C from 3 to 28 days. The rates of degradation of DDT were related to the rates of formation of ferrous iron in the amended soils. A relation was also obtained between the redox potential and the DDT degradation in the soils. With an *in vitro* iron redox system, 20% of the original DDT was converted to DDD (TDE) after 7 days. It was concluded that DDT underwent an irreversible redox type of reaction. A mechanism is proposed for the degradation of DDT whereby electrons furnished by the reduced organic substrate are transferred to the DDT molecules *via* the Fe^{2+} ions thus initiating a free radical reaction in the absence of oxygen. (Author abstract reprinted by permission of the American Chemical Society).

72-0956. Bonderman, D. P.; Slach, E. (Dept. of Clinical Pathology, Indiana U. Medical Center, Indianapolis, IN 46202). **Appearance of 1-hydroxychlordene in soil, crops, and fish.** *J. Agr. Food Chem. 20(2): 328-331; 1972.* (14 references)

A 4-year study in an area of eastern Iowa revealed the presence of a metabolite of heptachlor, 1-hydroxychlordene, in soil, various crops, and fish. Tissues and fluids obtained from human subjects from this area did not reveal the presence of this metabolite. The concentration of 1-hydroxychlordene found in soils in conjunction with heptachlor is consistent with the short half-life reported by Bowman. The appearance of this metabolite in fish is associated with heptachlor and heptachlor epoxide. Translocation of heptachlor and metabolism in crops account for the appearance of the compound in produce. (Author abstract reprinted by permission of the American Chemical Society.)

72-0957. Rauscher, H.; Mayr, G. E.; Sullivan, J. B. (DEGESCH, Neue Mainzer Strasse 1, 6 Frankfurt am Main, Germany). **Sorption and recovery of phosphine.** *J. Agr. Food Chem. 20(2): 331-333; 1972.* (9 references)

Minute quantities of phosphine were added to several cereal products and inert materials to investigate if temperature, duration of contact, and various aeration conditions would alter recovery. Previous experiments had shown that phosphine could diffuse through porous materials quite readily, so diffusion studies were also conducted at room temperature and elevated temperature conditions. Loss of added phosphine and poor recovery were shown to occur at elevated temperatures from systems containing cereal products or inert materi-

als when proper precautions were not taken to insure an airtight system. Loss of phosphine was prevented and recovery greatly improved when an airtight system was used in the experiment. (Author abstract reprinted by permission of the American Chemical Society).

72-0958. Hilton, H. W.; Mee, J. M. L. (Hawaiian Sugar Planters' Association, Honolulu, HA 96822). **Studies with radioactive phosphine-^{32}P in sugarcane.** *J. Agr. Food Chem. 20(2): 334-336; 1972.* (9 references)

Because zinc phosphide (Zn_3P_2), used as a rodenticide in sugarcane fields, would be expected to release phosphine, studies were undertaken to determine the behavior and fate of phosphine in a number of related substrates. Radioactive phosphine-^{32}P was applied to sugarcane leaves, to roots of sugarcane plants growing in nutrient culture, to chopped sugarcane to be analyzed for residues, to soil, to sugarcane juice, and to oat groats used for rodent bait. From 30 to 60% of the applied material formed nonvolatile phosphorus compounds. The reaction products were largely water-soluble and appeared to be oxyacids of phosphorus. (Author abstract reprinted by permission of the American Chemical Society).

72-0959. Woolson, E. A.; Thomas, R. F.; Ensor, P. D. J. (Pesticide Regulation Div., Environmental Protection Agency, Beltsville, MD 20705). **Survey of polychlorodibenzo-*p*-dioxin content in selected pesticides.** *J. Agr. Food Chem. 20(2): 351-354; 1972.* (5 references)

One-hundred-twenty-nine samples of 17 different pesticides derived from chlorophenols were examined for polychlorinated dibenzo-*p*-dioxins by electron capture gas chromatography. The method of cleanup involved a concentrated sulfuric acid extraction of impurities from hexane and a mild nitration of the chlorophenol extracts. Seventy-six percent of the samples analyzed contained less than 0.1 μg/g of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in the technical material, whereas 7% contained between 0.1 to 1.0 μg/g, and 9% contained greater than 10 μg/g TCDD. No TCDD was detected in the 20 tri-, tetra-, or pentachlorophenol samples examined. However, high levels of other dioxins were found. All samples which contained more than 1.0 μg/g of dioxin by electron capture gas chromatography were confirmed by gas chromatography using a flame ionization detector, a microcoulometric detector, *p* values, uv irradiation, and/or gas chromatography/mass spectrometry. Samples of phenoxy herbicides from current production contained less than 0.5 μg/g TCDD. (Author abstract reprinted by permission of the American Chemical Society.)

72-0960. Tucker, B. V.; Pack, D. E. (Ortho Div., Chevron Chemical Co., Richmond, CA 94804). **Bux insecticide soil metabolism.** *J. Agr. Food Chem. 20(2): 412-416; 1972.* (5 references)

Bux Insecticide [3 to 1 mixture of *m*-(1-methylbutyl)-phenyl methylcarbamate and *m*-(1-ethylpropyl)-phenyl methylcarbamate] is readily metabolized by soil organisms by attack at the carbamate ester linkage. Soils treated separately with *m*-(1-methylbutyl) phenyl methylcarbamate-*carbonyl*-^{14}C and *m*-(1-ethylpropyl)phenyl methylcarbamate-*carbonyl*-^{14}C evolved CO_2 as the parent carbamate content decreased. Each parent carbamate formed only one ^{14}C metabolite in the soil and it was present only in trace amounts. The main emphasis was placed on the major isomer of Bux Insecticide and its metabolite was identified as *m*-(1-hydroxy-1-methylbutyl)phenyl methylcarbamate. This metabolite is not persistent in soil but is degraded at about the same rate as the parent carbamate (50% loss in 1 to 2 weeks under laboratory conditions at ambient temperature). Six hydroxylated derivatives of the major isomer of Bux Insecticide were synthesized to aid metabolite identification. (Author abstract reprinted by permission of the American Chemical Society.)

72-0961. Masuda, Takeo (National Inst. of Agricultural Sciences, Nishigahara, Kita-ku, Tokyo, Japan). **[Organophosphorus pesticide residues.]** *Shokubutsu Boeki (Plant Prot.) 26(3):108-114; 1972.* (30 references) (Japanese)

Residue data officially reported in Japan for several organophosphorus pesticides (malathion, parathion, fenthion, fenitrothion, Hinosan, Inezin, Conen, Kitazin-P and Estox) on several field-grown food crops (unpolished and polished rice, rice bran, citrus, processed tea, radish, sugar beet, cocoa beans and grasses) are listed in tabular form. When applied to the surface of the water in paddy fields in granular form, organophosphorus insecticides were more persistent than when applied as powders or liquids. Application at 750 g/ha resulted in the following residues in or on unpolished rice after 79 days: diazinon, 0.02 ppm; dimethoate; 0.04 ppm; disyston, 0.15 ppm. Kitazin-P, similarly applied, was found at 0.001 to 0.007 ppm in unpolished rice and 0.27 to 3.92 ppm in rice straw at harvest, depending on the time and rate of application. Microbial degradation represents the major mechanism for disappearance of organophosphorus pesticides from soil. Increased analytical precision is required in order to detect metabolites as well as unchanged organophosphorus compounds. Residues of insecticides and of fungicides applied for the control of rice blast are easily removed from the surfaces of food crops, but systemic residues are more difficult to remove.

72-0962. Deura, H. (Environmental Hygiene Laboratory, Lion Fat and Oil Co. Ltd., Hirai-3-chome, Edogawa-ku, Tokyo, Japan). **[Studies on removal of residual pesticides from vegetables. I. Removal of residual pesticides from Chinese cabbage.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 13(1): 63-67; 1972.* (10 references) (Japanese)

The efficiency of removal of pesticide residues upon washing with aqueous detergent solution and water was studied using Chinese cabbage (*Brassica chinensis L.*) cultivated on an experimental farm and sprayed with either a 0.33% lead arsenate suspension or a 0.33% γ-BHC (lindane) emulsion while growing. The lead content of the vegetables before washing was about 1 ppm, the arsenic (as arsenic oxide) content about 17 ppm, and the lindane contents, 3 and 8 ppm in two samples harvested on different dates. The efficiency of removal was calculated from the fractions of the pesticide content found in the wash and rinse liquids. Detergent washing resulted in almost complete removal of lead and arsenic. The efficiency of lindane removal by detergent washing was more than twice as high as that attained by washing with water alone. A further significant fraction was removed by rinsing after washing with water. However, a considerable fraction of lindane still remained on the vegetable, presumably as a result of dissolution in the layer of wax on the surface of the vegetable leaf, which was found to contain more lipids than the leaf-surface layer of white cabbage.

72-0963. Deura, H. (Environmental Hygiene Laboratory, Lion Fat and Oil Co. Ltd., Hirai 3-chome, Edogawa-ku, Tokyo, Japan). **[Studies on removal of residual pesticides from vegetables. II. Removal of residual pesticides from Shantung greens and other vegetables by washing.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 13(1):68-73; 1972.* (5 references)

The efficiency of removal of pesticide residues from vegetables by various washing procedures was calculated on the basis of a determination of pesticides in used wash and rinse fluids. Shantung greens repeatedly sprayed with lead arsenate, Sumithion (fenitrothion) and Elsan (phenthoate), cucumbers sprayed with Sumithion, tomatoes sprayed with malathion, and cabbage sprayed with dichlorvos were washed with water or a detergent solution by dipping, shaking or brushing, then rinsed three times. Lead and arsenate were removed more efficiently and completely by detergent washing. In the case of the organic pesticides, washing with detergent was more effective than washing with water, and an even greater protion of the pesticide was removed by the application of mechanical processes such as brushing or shaking. However, even in the optimal case, the removal efficiencies for Sumithion (70%) and Elsan (47%) were still low. This was attributed to penetration of these insecticides into the plant tissue.

See also **72-0891 72-0893 72-0894 72-0899 72-0900 72-0903 72-0906 72-0907 72-0909 72-0910 72-0966 72-0968 72-0970 72-0971 72-0999 72-1011 72-1018 72-1025 72-1046 72-1047 72-1057 72-1058 72-1059 72-1063 72-1094 72-1096 72-1097 72-1099 72-1100 72-1101 72-1104 72-1105 72-1113 72-1114 72-1118 72-1124**

72-0964. Shaw, M. W. (Biology Dept., U. of Texas Graduate School of Biomedical Sciences, Houston, TX). **Human chromosome damage by chemical agents.** *Annu. Rev. Med. 21: 409-432; 1970.* (16 references)

A review is presented of chemical agents which break chromosomes, referred to as chemical "clastogens". Pesticides which have been found to be clastogenic in human cells, *in vivo* or *in vitro*, include: arsenicals, carbon tetrachloride, nitro compounds, ethylene oxide, lindane, lead, Apholate (aziridine), Captan, Hemel (HML), Hempa (HMP), Tretamine (TEM), triethylenephosphoramide (TEPA), triethylenethiophosphoramide (thio-TEPA) and trimethylenephosphoramide (TMPA). Some substituted derivatives of melamine or phosphoramide employed as insect chemosterilants are also extensively used as antileukemic drugs and as carcinostatic agents. DDT, although mutagenic in nonmammals, has not yet been proven to be clastogenic in the concentrations tested. The stable rearrangements resulting from chromosome breakage concern the physician most because they can produce unbalanced genetic constitutions and may be passed on to future generations. The spontaneous abortion rate or the mongol birth rate are suggested as possible monitors for human "genetic catastrophe."

72-0965. Sugaya, T. (Inst. of Rural Medicine, Hiraga General Hosp., Yokote-shi, Akita Pref., Japan). **[Clinical aspects of poisoning with organochlorine insecticides.]** *Baioteku (Biotech) 3(3): 185-193; 1972.* (21 references) (Japanese)

Organochlorine pesticide residue problems in human milk and tissues have been under investigation in Japan since 1970; however, many questions regarding the pathogenetic mechanisms and features of these compounds remain unanswered. Acute organochlorine poisoning also occurs; for example, 197 cases of endrin intoxication (13% of all pesticide poisonings), 184 of them fatal, were reported in Japan in 1969. The majority of these were with suicidal intent; the number of unreported cases is probably quite high. Neurological disturbances dominate the clinical picture in organochlorine poisoning; the primary symptoms include eye pain, prostration, sweating and nausea. Accompanying signs include rapid, irregular pulse, hypertension or hypotension, dullness, depressed reflexes, restlessness, loss of coordination, muscle spasms of varying degrees, and loss of consciousness. Local manifestations include abscess formation, various skin eruptions, and secondary eye infections. Clinical findings in chronic exposure include eczema, chloracne, urticaria, and pannus. Although reports on chronic organochlorine poisoning in man are scarce, animal studies have revealed histopathological changes in liver and kidney following chronic dieldrin administration, thus indicating that it may act as a predisposing factor to diseases of these organs in man.

72-0966. Pillmore, R. E.; Flickinger, E. L.; Richmond, M. L. (Wildlife Research Center, U.S. Bur. of Sport Fisheries and Wildlife, Denver, CO). **Forest spraying of Zectran and its safety to wildlife.** *J. Forest. 69(10): 721-727; 1971.* (9 references)

Potentially harmful effects to wildlife resulting from the spraying of forested areas with naled and Zectran were sought by comparing bird and mammal counts made before and after spraying over a 3-year period. Within the experimental error, no reductions in these counts were found after the aerosol spraying of 20-acre plots, or in comparison to untreated plots. Tracer materials included in the pesticide spray formulation were found in the plumage and intestines of birds shot after spraying, showing that exposure of birds to the pesticides did occur. No behavioral or clinical abnormalities were observed except in the case of one chipmunk captured in an area unintentionally sprayed with large droplets; this animal showed a temporary but marked increase in respiration. Contrary to expectation, the small mammals were found to feed on the target insects, spruce budworm larvae; however, consumption of sprayed insects appeared to have no harmful effects. Evaluation of the results of such trials is made extremely difficult by a large number of factors, such as differences in physiography and land use of areas studied, or in species behavior and conspicuousness at different times, which may account for variations in population counts.

72-0967. Katsenovich, R. A.; Usmanova, I. Y. (Uzbek Research Institute for Sanitation, Hygiene and Occupational Diseases, Tashkent, USSR). **K vyyavleniyu protivopechenochnykh autoantitel u lits, imeyushchikh kontakt s pestitsidami. [On the appearance of liver autoantibodies in persons in contact with pesticides.]** *Med. Zh. Uzb. 7: 6-8; 1970.* (Russian)

Liver autoimmunization processes due to the toxic effects of pesticides were studied through the determination of liver autoantibodies, using the complement fixation reaction. Of the 40 persons investigated, 35 had been in contact with organochlorine and organophosphorus pesticides for 2 to 20 yr. Out of a group of 19 persons with serious digestive or nervous disorders, liver autoantibodies were detected in 17. Four of these (durations of contact 7, 12, 13, and 20 yr, respectively) showed highly positive reactions; three displayed toxic and moderate hepatitis and functional hepatopathy. In the six persons of the second group, persons showing isolated symptoms of poisoning, liver autoantibodies and four cases of liver dysfunction were found. Liver autoantibodies were detected in four persons of a third group of eight in whom symptoms of poisoning were not apparent. Thus the formation of autoantibodies is one of the first, nonspecific signs of pathological processes, and may be of causative significance.

72-0968. Khasanov, V. Kh.; Li, A. P. (Khorezm Reg. Sanitary and Epidemiology Station, Khorezm, USSR). **Opyt izucheniya aktivnosti kholinesterazy krovi kak pokazatelya vliyaniya fosfororganicheskikh yadokhimikatov na zdorov'ye naseleniya. [Experience in studying blood cholinesterase activities as an index of the effect of organophosphorus compounds on the population's health.]** *Med. Zh. Uzb. 7: 12-13; 1970.*

During the period of cotton crop treatment with methyl mercaptophos, most of 33 teenagers from a rural area showed a 28% decrease in blood cholinesterase activity; 9 subjects from this group had a 50% enzyme level decrease. During defoliation treatment with butyphos (DEF) 31 of 33 subjects in the same group showed a 12% blood cholinesterase decrease. Blood cholinesterase dropped 28.6% in workers who were occupationally exposed to these organophosphorus pesticides. These data reflect a certain degree of air contamination with the above pesticides. According to data from analyses performed on 162 air samples, taken one day following field treatment, residues ranged between 0.85 and 1.16mg/m^3 near the treated area, between 0.31 and 0.55 at a 500 m radius, between 0.17 and 0.40mg/m^3 at a 700 m radius and from 0.06 to 0.2mg/m^3 at a 1000 m radius around the treated area. Determination of blood cholinesterase levels in different population groups can be used as an index in the exploration of air contamination with organophosphorus pesticides.

72-0969. Agzamov, S. K. (Tashkent Med. Inst., Tashkent, USSR). **Sostoyaniye organa slukha u lits, svyazannykh s primeneniyem yadokhimicatov v sel'skom khozyaystve. [Condition of the ear in persons involved in agricultural applications of chemical poisons.]** *Med. Zh. Uzb. 7: 13-15; 1970.* (Russian)

Audiograms from ground level workers exposed to pesticide handling in the fields of Uzbekistan showed impaired perception of high tones which were associated with alterations in the conductivity curve of the bones of the middle ear. Subjects of this population appeared to have neglected the wearing of protective PVC capes and the use of masks when prescribed. No hearing alterations were found among the worker population involved in aerial spraying, who seem to have respected all the regulations prescribed for prophylaxis against pesticide exposure.

72-0970. Rozin, D. G.; Satyvaldiyev, A. S. (Andizhan Reg. Sanitary and Epidemiology Station, Andizhan, USSR). **Sluchay ostrogo otravleniya geksakhloranom. [A case of acute poisoning with BHC.]** *Med. Zh. Uzb. 7: 74; 1970.* (Russian)

A 60-yr-old worker who had been involved in a cotton husk unloading operation for one day developed acute poisoning with BHC. This man was working in a confined room where the temperature was 42°C. The victim had a methyl mercaptophos poisoning episode in his history. At the end of the working day he started complaining of weakness, headache and nausea. Vomiting, diarrhea and limb spasms developed a few hours later. Arterial pressure dropped to 100/60 mm Hg while pulse frequency reached 137/min. Enhanced respiration, narrowed pupillae, pain in the epigastric region and a 39.4°C temperature constituted the other symptoms. No alterations in blood cholinesterase level were found. Atropine injections and symptomatic treatment led to the patient's recovery within 6 days. Neurological examination 10 days following the episode showed minor "high glove type" hyperesthesia. The cotton husk appeared to contain 0.1 mg/kg of BHC.

72-0971. Angela, G. C.; Di Siena, F. (Ospedale Civile S. Croce, Lab. di Analisi e Ricerche Cliniche, Cuneo, Italy). **In tema di emopatie iatrogene. Recenti aspetti dell' effetto dei farmaci sugli elementi figurati del sangue. [On iatrogenic blood diseases. Recent features of the action of pharmaceutics on blood morphology.]** *Minerva Med. 61(98): 5659-5676; 1970.* (references published separately) (Italian)

Iatrogenic damage to blood is reviewed, and sequelae from use of antibiotics, sulfonamides, antineoplasia pharmaceuticals, solvents, drugs (LSD) and insecticides are included. Reference is made to BHC as a compound capable of inducing aplastic anemia while DDT is included in the category of compounds causing occasional granulocytopenia. Dinitrophenol is capable of inducing leukemia, and naphthalene is mentioned among the compounds producing hemolysis in glucose-6-phosphate dehydrogenase-deficient erythrocytes. Various attempts to interpret the pathogenetic mechanisms involved in generating disorders in blood are reviewed.

72-0972. Blus, L. J.; Gish, C. D.; Belisle, A. A.; Prouty, R. M. (Patuxent Wildlife Research Center, Laurel, MD 20810). **Logarithmic relationship of DDE residues to eggshell thinning.** *Nature (London) 235(5338): 376-377; 1972.* (25 references)

Because of the demonstrated cause-and-effect relationship between DDE ingestion and eggshell thinning in wild birds, an attempt was made to define the mathematical relationship between DDE residue levels and degree of eggshell thinning in various bird species. In the primary analysis, 80 eggs were collected in 1969 and 1970 from 12 brown pelican colonies: nine in Florida, one in California and two in South Carolina. The percentage of eggshell thinning was determined in comparison with the pre-1947 level as computed by Anderson and Hickey; DDE residues were determined by gas chromatography. Eggshell thinning was found in 11 of the 12 colonies. Thinning in the Florida colonies ranged from 13% to nil (actually a 0.4% increase); in South Carolina colonies, it averaged 17%; and in the California colony, where reproductive failure occurred in 1969, it amounted to 35%. Plotting the eggshell thinning as a

function of log DDE concentration yielded a statistically significant regression; covariance analysis revealed that the slopes of the regression lines for the three colonies were essentially similar. Other birds tested, such as the herring gull and double-crested cormorant, seemed somewhat more resistant to development of eggshell thinning, but concentration-effect relationships were indicated despite the small number of samples.

72-0973. Wolfe, H. R. (Wenatchee Research Station, Perrine Primate Lab., Environmental Protection Agency, Wenatchee, WA). **Protection of workers from exposure of pesticides.** *Pest Contr. 40(2): 17-18, 20, 38, 42; 1972.*

Indirect methods of protecting the pest control worker include providing education and medical supervision, stressing the importance of personal hygiene and cleanliness, emphasizing the importance of being careful, and pointing out the need for reading and following directions on the pesticide label. More direct methods of protecting the various routes of entry of pesticides into the body are discussed. The four routes of entry of pesticide compounds into the body are (1) dermal, (2) respiratory, (3) oral, and (4) through cuts or abrasions in the skin. Each route is discussed with emphasis placed on means of preventing exposure. Results of dermal absorption studies have indicated that the head-neck area is particularly susceptible to pesticide poisoning, whereas the hands are the body area having the highest exposure to pesticides. Present clothing habits of pesticide workers are discussed for each route of entry.

72-0974. Szelag, J.; Maciejewska, K.; Glowaczewska, I.; Trzciankowska, A.; Skrabielinski, R. (Wojewodzka Stacja Sanitarno-Epidemiologiczna w Warszawie-Aninie, Warsaw, Poland). **Proba epidemiologicznej oceny wystepowania zatruc pestycydami na terenach sadownictwa w powiatach Grojec i Sochaczew. [An epidemiologic analysis of the prevalence of pesticide intoxication in the orchard regions of Grojec and Sochaczew counties.]** *Przegl. Epidemiol. 25(2): 303-308; 1972.* (7 references) (Polish)

In two Polish counties, Grojec and Sochaczew, 2118 cases of "food poisoning", in which gastrointestinal symptoms were predominant, were reported between 1965 and 1967. Analysis of these cases revealed 30 instances of definite and 100 instances of probable pesticide poisoning. Of the 30 definite cases, 9 occurred with suicidal intent, 9 under unknown circumstances, and 12 as accidental or occupational poisonings, mainly due to consumption of sprayed fruits or to drinking liquid pesticide-containing compositions by mistake. Symptoms and treatment are described for several of the cases. Instances where the agent responsible for poisoning was known included intoxications with aldrin, metasystox (methyl demeton), azotox and cresotol.

72-0975. Mauranges, P. (Author address not given). **Intoxications alimentaires dues aux insecticides contaminant la farine. [Food poisonings due to insecticide-contaminated flours.]** *Sem. Med. Prof. Med. Soc. 46(20): 399-400; 1970.* (French)

The importance of proper handling and transportation of insecticides is emphasized, and three massive poisonings which occurred in the Middle East due to improper handling of these products are analyzed. During a massive poisoning in Doha (emirate Qatar) 490 persons were hospitalized; seven of these died. A second poisoning a month later had a death toll of 17, out of 188 persons hospitalized. In a Holaf (Saudi Arabia) poisoning, two of the 183 persons hospitalized died. The first poisoning originated in a bakery where a hexachlorobenzene-based poison was used to control rats and mice. Organochlorine contents up to 220 ppm were revealed in bread baked there. The second and third poisoning episodes were caused by flour delivered on a ship that carried endrin.

72-0976. Ogurok, A. P. (Regional Lab. Veterinary Med., Khmel'nitskiy, USSR). **Sluchay otravleniya zhivotnykh granozanom. [A case of poisoning of animals by Granosan.]** *Veterinariya 47(6): 88-89; 1971.* (Russian)

The symptoms of a fatal mass poisoning incident in hogs, originally mistaken for symptoms of Aujeszky's disease, a disease of the central nervous system, are described. The bioassay for Aujeszky's disease was negative, however, and the discovery of Hg in the liver, brain, kidney and muscles of the diseased animals led to the conclusion that mercury poisoning had occurred. Hogs had been fed barley destined for seed and treated with Granosan. The first symptoms of disease occurred 20 days later. Cattle were less sensitive to Granosan poisoning.

72-0977. Anonymous. **Organic phosphate poisoning (parathion).** *Va. Med. Mon. 98: 459; 1971.*

In conjunction with an intensive program to prevent parathion poisoning, conducted by the Virginia Department of Agriculture and Commerce in cooperation with the U. S. Department of Agriculture and the pesticide industry, physicians are informed of the highly toxic nature of this organophosphate compound and of treatment recommendations. In severe cases the levels of cholinesterase enzymes are reduced to 10 to 20% of normal and regeneration is quite slow. Atropine sulfate, 2 to 4 mg, should be administered intravenously (or intramuscularly as soon as cyanosis is overcome) and repeatedly until signs of atropinization appear. 2-PAM chloride may be administered in conjunction with atropine. Patients should be given supplemental oxygen at the first sign of pulmonary edema and should have close supervision for at least 48 hours. Procedures to determine whether ethyl parathion was the cause of any given poisoning are available through Virginia poison control

centers. The program will also include education of sellers and purchasers of parathion along with posting of treated fields.

72-0978. Anonymous. **[Safe disposal of organochlorine pesticides.]** *Shokubutsu Boeki Sokuho (Plant Protection News) 840: 6-8; 1972.* (Japanese)

At each of the regional plant protection conferences held in 9 regional centers in Japan at the beginning of each year under the sponsorship of the Ministry of Agriculture and Forestry, the ministerial representative explained to the prefectural attendees various aspects of the safe disposal of large quantities of those organochlorine pesticides which have now been officially banned in Japan. The official recommendations call for the establishment of an "Association for Safe Disposal of Pesticides," including representatives of municipalities, agricultural cooperatives, agricultural mutual relief associations, pesticide distributors and manufacturers, and any other agencies concerned with the management of disposal. It is also recommended that the organochlorine pesticides be buried in an underground concrete tank where no danger of water contamination or tank breakage exists. The government (national and prefectural) will offer support and supervision for these programs.

72-0979. Fazekas, I. G. (Inst. of Forensic Medicine, U. of Szeged, Hungary). **Ueber die makroskopischen und mikroskopischen Veraenderungen bei der Wofatox-Vergiftung (Methyl-Parathion). [Macroscopic and microscopic changes in Wofatox (methyl parathion) intoxication.]** *Z. Rechtsmed. 68: 189-194; 1971.* (19 references) (German)

Gross and microscopic alterations were found in all examined organ specimens from 30 persons fatally poisoned with Wofatox (methyl parathion). Death occurred within 2 hours to 9 days after poison ingestion; the victims were between 18 and 82 years of age. Twenty-six of the cases involved suicide (oral ingestion), and 4 involved accidental skin and respiratory contact. The principal abnormalities observed in the autopsy specimens were generalized edema and hyperemia, followed by degenerative changes in those cases in which survival was prolonged. In cases in which death occurred unexpectedly after several days of survival, multiple pericapillary and periprecapillary hemorrhages were noted in the myocardium and medulla oblongata.

72-0980. Clifford, N. J.; Weil, J. (Community Pesticide Study, P.O. Box 579, Greeley, CO 80631). **Cortisol metabolism in persons occupationally exposed to DDT.** *Arch. Environ. Health 24(2): 145-147; 1972.* (11 references)

The rapid one-hour screening test for adrenal cortical insufficiency was performed upon ten men with relatively high blood levels of DDT and upon normal controls. All individuals demonstrated normal adrenal function. It is concluded that no deleterious effect on adrenal cortical secretion of cortisol is present in men occupationally exposed to DDT. (Author abstract by permission).

72-0981. Lebreton, P. (Entente Interdepartementale Ain-Isere-Savoie pour la Demoustication, Faculte des Sciences, Grenoble, France). **Insecticides et oiseaux. [Insecticides and birds.]** *Bull. Mens. Soc. Linn. Lyon 39(8): 54-60; 1970.* (French)

The effects of organochlorine and organophosphate insecticides, widely used in mosquito control, on bird life are reviewed. Although it is difficult for the ornithologist to choose between the organochlorines, with their demonstrated ill effects on avian reproduction, and the organophosphates, which are capable of causing massive and rapid bird losses if improperly applied, the persistent organochlorines appear to offer the greatest hazard in the long run. Acute organochlorine poisoning of birds is rarely reported, but many cases classed as chronic poisoning are actually delayed-acute rather than chronic, i.e., a massive dose may be stored in adipose tissue, and released in time of stress. Mortality and reproductive failure have been noted most often in raptors because of their position at heads of food chains: an application of an organochlorine insecticide to vegetation at 0.05 ppm may be multiplied to a lethal dose of 50 ppm in raptors feeding on insectivores in the same area. Similar multiplication via aquatic food chains is responsible for mortality and nesting failure in water birds. Clear correlations between tissue levels of organochlorine insecticides and appearance of neurological symptoms or death were found for predatory and aquatic birds as well as grain-eating species. (For Part 2, see abstract no. 72-0982).

72-0982. Lebreton, P. (Entente Interdepartementale Ain-Isere-Savoie pour la Demoustication, Faculte des Sciences, Grenoble, France). **Insecticides et oiseaux (suite). [Insecticides and birds (conclusion)].** *Bull. Mens. Soc. Linn. Lyon 39(9): 66-72; 1970.* (French)

In the conclusion of this two-part report (for Part 1, see Abstract No 72-0981), non-chemical methods of insect (especially mosquito) control are reviewed in terms of their effects on bird populations. Physical control methods, although seeming relatively safe at first, can actually cause widespread bird losses due to destruction of habitat and food supply as well as direct kills. Insect-control techniques involving massive environmental destruction, such as draining of swamps and burning of briar-patches, are undesirable. Biological control methods have been highly successful in some instances and offer excellent specificity (thus practically no threat to nontarget animals), but are very costly and of limited availability. The principle of integrated control is an excellent one, but the actual circumstances

demand meticulous observation by conservationists during and after the application of combined treatments.

72-0983. Bubien, M. Z.; Magat, A.; Delatour, P. (Toxicology Lab., Veterinary Faculty, School of Agriculture, Wroclaw, Poland). **Frequence des intoxications des animaux en Pologne. (Frequency of poisoning of animals in Poland).** *Bull. Soc. Sci. Vet. Med. Comp. Lyons 72(2): 167-173; 1970.* (17 references) (French)

According to the records of the Veterinary Toxicology Laboratory of the Agriculture Institute in Wroclaw, Poland, 76,744 animals died of poisoning in Poland between 1949 and 1963. This represents only a fraction of the actual number, due to incomplete reporting. The majority of cases concerned poisoning by pesticides, poisonous plants and synthetic food mixtures. During the time period in question, a total of 63,669 poisoning cases, including 56,336 cases of poisoning in chickens, was caused by ingestion of zinc phosphide-treated grain. Arsenic was the pesticide involved in 2,845 cases, while 2,518 cases were due to poisoning by miscellaneous chemicals including the pesticides strychnine, thallium and DNOC. From 1964 to 1969, cases of zinc phosphide and arsenic poisoning decreased, whereas increasing numbers of cases involving poisoning with newer agrochemicals were reported. Statistics for this latter period are not yet available.

72-0984. Lebhar, J.; Giraud, P. A.; Vacher, J. (Institut National de Medecine Agricole, Faculte de Medecine, F-37 Tours, France). **Le risque toxique pulmonaire en agriculture. (The risk of pulmonary poisoning in agriculture).** *Cah. Med. 12(8): 621-626; 1971.* (1 reference) (French)

Pulmonary poisoning in an agricultural milieu is generally an aspect of rural air pollution, except in the rare cases of irritation by pulmonary excretion of materials ingested or spilled on the skin. In the superacute form of pulmonary poisoning, symptoms of massive asphyxiation develop within a few hours after exposure. The acute or subacute form resembles bronchopneumonia, acute bronchitis or toxic edema. The chronic form resembles chronic bronchitis or emphysema. The poisoning may take place under different circumstances, depending on whether the substance in question is a liquid or solid insecticide or herbicide, or a fumigant. Emergency treatment should be applied where necessary, and the patient admitted to a poison control center as soon as possible. Preventive measures include proper labeling and use, and specifically, avoidance of pesticide application in the presence of high winds or during noonday heat. In France, occupational poisoning is an indemnifiable disease; reporting all cases of agricultural pulmonary poisoning by physicians will aid future preventive efforts.

72-0985. Tempe, J. D.; Kurtz, D. (Service de Reanimation Pasteur, C.H.U., Strasbourg, France). **Intoxication aigue par le chloralose. [Acute chloralose intoxication.]** *Concours Med. 94(5): 801-813; 1972.* (14 references) (French)

Acute chloralose intoxications, 22 within a ten-year period, accounted for 1% of the acute poisoning cases treated at the Service Reanimation de Pasteur. All were of suicidal intent; 21 involved rodenticides and 1, a chloralose-containing drug. The authors found 60 chloralose-containing pesticides (raticides or corvicides) on the market in France: 27 containing chloralose alone, 31 containing chloralose plus ANTU, and one each of chloralose plus anthraquinone and chloralose plus warfarin. The minimum lethal dose of chloralose is approximately 0.1 g/kg. The symptomatology of intoxication is characterized by coma of variable depth, accompanied by signs of motor agitation, including convulsions. The EEG exhibits a paroxysmal type of arrhythmia dominated by delta waves at 2 to 3 cycles per second. Mixed ANTU-chloralose intoxication produces more intense pulmonary symptoms than chloralose intoxication alone. Treatment comprises general poison-removal measures (gastric lavage, forced diuresis, and dialysis) followed by symptomatic treatment to reduce agitation and maintain vital functions. Diazepam is a useful anticonvulsant. All of the 22 cases presently considered responded to this treatment, recovering rapidly without sequelae.

72-0986. El-Samra, G. H. (Dept. of Industrial Medicine, Faculty of Medicine, Cairo U., Cairo, UAR). **Toxicity of DDT.** *J. Egypt. Med. Ass. 54(1): 74-82; 1971.* (25 references)

The prevention, treatment and symptoms of DDT poisoning in man are reviewed. Acute DDT poisoning mainly occurs with suicidal intent or accidentally as a result of careless handling, and is infrequently encountered in an occupational context, although chronic exposure may occur occupationally. As little as 10 mg/kg of DDT in a single dose may produce illness, but not convulsions, in some humans; under chronic exposure conditions, certain individuals may show mild illness at 2.5 to 5.0 mg/kg/day. Some investigators regard the manifestations in the latter case simply as prolongations of acute effects; however, recent studies have demonstrated the existence of pathological alterations in liver cell morphology and incipient liver function disturbances in workers exposed to DDT and lindane for a long time. Because of the low toxicity of DDT, the conscientious application of prophylactic measures should forestall the occurrence of poisoning in most workers handling this substance.

72-0987. Milosavljevic, Z.; Prodanovic, M. (Institut za Medicinu Rada i Radiolosku Zastitu SRS "Dr. D.K.", Belgrade, Yugoslavia). **Ocena radne sposobnosti u slucajevima profesionalne ekspozicije i prilikom trovanja pesticidima. [Evaluation of working capabilities under**

conditions of occupational exposure and during pesticide poisoning.] *Med. Glas. 24(8-9): 379-382; 1970.* (3 references) (Serbo-Croatian)

Persons occupationally exposed to pesticides, either in the manufacture of the active ingredients or in the transport and application of the finished formulations, are endangered due to both the high toxicity of the pesticides and the inadequate safety precautions in the work areas. Persons with certain types of preexisting disabilities, e.g., mental deficiencies, tendency to dermatitis, chronic respiratory disease, vascular abnormalities or endocrine disorders, should be excluded *a priori* from occupational contact with pesticides. The medical surveillance program employed must be suited to the types of chemicals handled; for example, periodic cholinesterase determinations are required in persons working with organophosphate pesticides, whereas the appearance of any unexplained clinical symptoms in persons working with dinitro compounds or organochlorine compounds should prompt a search for these compounds and their derivatives in the blood.

72-0988. Cosic, V.; Kop, P.; Kusic, R.; Piroskov, B. (Klinika za Unutrasnje Bolesti VMA, Belgrade, Yugoslavia). **Neka zapazanja o akutnim trovanjima hemijskim noksama na radu. [Observations on acute occupational poisoning by chemical noxae.]** *Med. Glas. 24(8-9): 386-390; 1970.* (17 references) (Serbo-Croatian)

Occupational poisoning cases comprised 15% of the poisoning victims admitted to the VMA Polyclinic at Belgrade between 1961 and 1969; 46 patients with acute occupational poisoning were admitted between 1961 and 1964, and 159 from 1965 to the first half of 1969. Out of this group of 205 patients, there were three cases of occupational pesticide poisoning: 2 with Radosan and 1 with Kreozan. All of the pesticide poisoning cases were attributable to carelessness in following instructions, and all three were classified as mild in degree. There were no fatalities, but residual effects were still present at the time of discharge from the hospital in one of the patients. The average length of hospitalization was 5.6 days.

72-0989. Bermejillo, M. (Instituto y Escuela Nacional de Medicina y Seguridad del Trabajo, Madrid, Spain). **Intoxicacion laboral por el tri-ortocresil-fosfato. [Occupational poisoning by tri-*ortho*-cresyl phosphate.]** *Med. Segur. Trab. 19(74): 49-58; 1971.* (Spanish)

In 1970 an outbreak of tri-*ortho*-cresyl phosphate poisoning occurred among workers in the footwear industry in Alicante Province, Spain. Tri-*ortho*-cresyl-phosphate poisoning was diagnosed in 32 of the 48 persons who presented themselves to the Institute of Occupational Medicine for examination. Neurological examination of an 18-yr-old boy who developed a flaccid paralysis culminating in temporary quadriplegia revealed osteo-tendineous areflexia with maintenance of superficial and deep sensory capabilities, and severe lesions of somatic motor neurons, coinciding with descriptions of tri-*ortho*-cresyl phosphate poisoning in the literature. A search for the source of tri-*ortho*-cresyl phosphate in this and other cases revealed minimal contamination, with the rubber cement used in gluing shoes the only potential source. The development of symptoms in the cases observed was apparently due to individual hypersensitivity or failure to observe even the minimal rules of occupational safety, especially when overtime work was performed in the home. Recovery occurred within a year in all cases, accelerated by physiotherapy.

72-0990. Murai, Y.; Kuroiwa, Y. (Dept. of Neurology, Neurological Inst., Faculty of Medicine, Kyushu U., Fukuoka, Japan). **Peripheral neuropathy in chlorobiphenyl poisoning.** *Neurology 21(11): 1173-1176; 1971.* (13 references)

Some of the persons involved in an outbreak of "yusho" (polychlorinated biphenyl poisoning due to contaminated cooking oil) in Japan during the summer of 1968 complained of numbness or neuralgic limbs. Therefore, peripheral sensory nerve conduction velocity was measured in 21 such patients, and motor nerve conduction velocity in 19 of these. The motor nerve conduction velocity in the ulnar nerve was within the normal range in all of the patients; that in the tibial nerve was also normal, except in one patient with deep reflexes absent in all four limbs. In ten cases (48%), the sensory nerve conduction velocity was lower than normal in the radial or the sural nerves or both. In the group which displayed neuropathic symptoms in the lower limbs (about half of the total) six cases (75%) showed a slowing of conduction velocity in the sural nerve, whereas only one patient in the nonneuropathic group displayed reduced conduction velocity. These findings apparently represent early manifestations of a mixed-type polyneuropathy.

72-0991. Breen, P. T.; Conroy, J. D. (Mount Airy Pet Hospital, 2942 Banning Rd., Cincinnati, OH 45239). **Flea-collar contact dermatitis.** *Vet. Med. Small Anim. Clin. 66(12): 1181-1183; 1971.* (1 reference)

A flea collar containing 20% dichlorvos (DDVP) was found to be the cause of contact dermatitis in a 7-yr-old female Collie-cross dog. Generalized erythema and papules extended from the dorsum of the head to a point midway between the scapulae. Ulcerated lesions were found in the area in constant contact with the collar. Treatment included clipping and cleansing of the area, application of Liquichlor with Cerumene (EVSCO) 4 to 5 times daily and heavy sedation for 2 days followed by mild sedation for one week. It was recommended that at least 3 fingers should fit easily under the flea collar after it has been fastened in place to guard against a possible reaction.

72-0992. Szabuniewicz, M.; Bailey, E. M.; Wiersig, D. O. (Veterinary Physiology and Pharmacology, Coll. of Veterinary Medicine, Texas A and M U., College Station, TX 77840). **Treatment of some common poisonings in animals.** *Vet. Med. Small Anim. Clin. 66(12): 1197-1205; 1971.* (31 references)

The chemicals most frequently implicated in poisonings of small animals in the U.S. are lead, arsenic, thallium, organochlorine and organophosphate insecticides, warfarin, strychnine, and sodium fluoroacetate. A systematic approach to the treatment of poisoning by these and other chemicals is given including removal of the animal from the intoxicated environment, removal or neutralization of the chemical, administration of systemic and specific antidotes, hastening of elimination and application of supportive therapy. Unless contraindicated, emesis or lavage should be initiated within 4 hr postingestion. Activated charcoal is an excellent adsorbing agent for most toxic chemicals, but must be derived from vegetable sources and contain no minerals.

72-0993. Vangeli, V. S. (Author address not given). **Rol' sel'skogo fel'dshera v preduprezhdenii otravleniy pestitsidami [The role of the rural doctor's assistant in the prevention of pesticide poisoning.]** *Zdravookhranenie 13(3): 52-56; 1970.* (Russian)

Average medical workers, public health doctors' assistants, and nurses, should be more active in the prevention of pesticide poisoning. Examining people handling pesticides and educating them to handle and use the pesticides properly are some of the duties ascribed to the doctor's assistant. He should also observe the storage, transportation and the actual use of the pesticide (time, location, and amounts). The general public should also be informed of areas treated with pesticides.

72-0994. Barabash, V. I. (Leningrad, USSR). **Nervnopsikhicheskiye rasstroystva pri otravlenii khlorofosom. [Neuropsychiatric disorders in chlorophos (trichlorfon) poisoning.]** *Zh. Nevropatol. Psikhiat. imeni S. S. Korsakova 71: 594-598; 1971.* (14 references) (Russian)

Clinical studies of 82 cases of chlorophos poisoning revealed that the neuropsychiatric disorders occurring during the acute phase resemble those encountered in endogenous psychoses. The psychotic state is generally of short duration. The disappearance of psychotic symptoms is followed by the development of an asthenic state with numerous neurotic complaints, especially in severe or moderately severe intoxications. Symptoms of polyneuritis with motor and sensory disorders are sometimes observed. The psychic alterations consist of intellectual decline and memory impairment of the organic type. In profound intoxications, the mental changes are usually indicative of developing toxic encephalopathy.

72-0995. Kazmierczak, A. (Dept. of Industrial Stomatology and Stomatologic Medicines, Poznan, Poland). **Blona sluzowa jamy ustnej a aktywnosc cholinesterazy surowicy krwi u ludzi stykajacych sie zawodowo z pestycydami. [Oral mucous membranes and serum cholinesterase activity in persons occupationally exposed to pesticides.]** *Czas. Stomatol. 24(8): 895-900; 1971.* (16 references) (Polish)

The effect of chemicals used in plant protection (organophosphate and organochlorine pesticides) on the people exposed to them was investigated. The effects of pesticides on teeth, periodontium, and oral mucous membranes were studied, and the changes in blood cholinesterase activity were measured. The harmful effect of pesticides was obvious. In 84% of the cases studied, a decrease in cholinesterase activity was observed. Pathologic changes observed in the mouth included increased tartar deposits on teeth, swelling and hyperemia of interdental papillae and of gingival margins. The changes in mucous membrane manifested themselves by swelling and hyperemia. Changes in periodontium were similar to paradontopathia inflammata superficialis. The connection between pathologic changes in the oral cavity and a decrease in blood-serum cholinesterase activity is pointed out.

72-0996. Khasanov, V. Kh. (Khorezm Regional Sanitary and Epidemiological Station, Khorezm, USSR). **Gigiyenicheskiye printsipy rasseleniya sel'skogo naseleniya khorezma v svyazi s primeneniyem pestitsidov v khlopkovodstve. [The principles of hygiene applied in the population distribution of the rural areas in the Khorezm Region as related to the use of pesticides in cotton cultivation.]** *Gig. Sanit. 36(11): 104-105; 1971.* (Russian)

The rural population of the Khorezm region is exposed to pesticide pollution due to their increasing use in cotton growing, which constitutes the main occupation in this area. Environmental pollution by these pesticides is enhanced by the climatic features of the region, including high temperatures, low humidity and an almost total lack of precipitation during the period of their application (May to September). The intermingled distribution of cotton and crop fields as well as the scattered dwelling sites of the population constitute additional hazards in terms of exposure to pesticide contamination. Future mapping of town-like developments should take into account the pesticide utilization factor, and cotton fields should be concentrated and located apart from other agricultural areas.

72-0997. Burman, D.; Hodson, A. K.; Mott, M. G. (Bristol Royal Hospital for Sick Children, St. Michael's Hall, Bristol BS2 8BJ, England). **Paraquat poisoning.** *Lancet 1(7743): 201; 1972.* (6 references)

In a Letter-to-the-Editor, the authors report the death of an 18-month-old infant who tasted a 20% para-

quat solution (Gramoxone) stored in an unlabeled container. This was the third death due to paraquat poisoning in England and Wales in the past three years in children under five, making paraquat poisoning one of the leading causes of non-drug poisoning deaths in this age group. In 1967-1969, there were a total of 47 deaths, some by suicide, from paraquat poisoning among all age groups in the British Isles. Some change in formulation, packaging or labeling of the commercial preparation; or perhaps a total ban, is advised. In contrast to Gramoxone, the 20% paraquat-containing aqueous formulation, only one accidental death has occurred due to Weedol, the 5% paraquat preparation, which is available to the general public.

72-0998. Stepanek, O.; Kuzelova, M. (Department of Occupational Hygiene of District Hygienic Station, Chrudim, Czechoslovakia). **Inhalacni otrava Resistonem. [Inhalational poisoning with Resiston.]** *Prak. Lek. 52(1): 33-34; 1972.* (Czech)

Several cases of forest workers poisoned by Resiston inhalation are described. (Resiston is a product used in winter protective treatment of leafy and coniferous trees against animal gnawing). The symptoms of the poisoning are described. In all cases the protective measures recommended by the manufacturer were followed (use of protective cloths, eye goggles, rubber gloves); however, these proved insufficient, since they do not insure protection of respiratory organs.

72-0999. Egyed, M. N.; Tadjer, G. S.; Baranchuk, J. (Kimron Veterinary Inst., Bet Dagan, Israel). **Suspected Cyolane poisoning in three dairy herds.** *Refu. Vet. 28(3): 106-108; 1971.* (7 references)

The cause of a pathological syndrome related to the gastrointestinal tract in three dairy herds was investigated. In each case, lucerne pellets formed part of the diet, and feeding experiments using the batch of pellets fed to one of the herds indicated that the pellets were contaminated, possibly with an organophosphate. Failure of a qualitative thin layer chromatographic method to detect any contaminant and a report that some farmers were using Cyolane (2-[diethoxyphosphinylimino]-1,3-dithiolane) for controlling *Prodenia* infestation in lucerne led to the use of the more sensitive and specific TLC, gas chromatographic and colorimetric assays. The pellets and rumen contents were found to contain 1.26 ppm and 0.3 ppm of Cyolane, respectively. Cholinesterase blood levels were found to be reduced in affected cows. Although contrary to instructions for the pesticide, it appears that the use of Cyolane against *Prodenia* of lucerne is presenting a contamination problem.

72-1000. Nizov, A. A.; Shestakov, H. M. (Ryazan' Med. Inst., Dept. Internal Diseases, Ryazan', USSR) **K klinike podostrogo otravleniya granozanom. [Contribution to the clinical aspects of granosan poisoning.]** *Sov. Med. 11: 150-152; 1971.* (Russian)

A sudden repugnance to sunflower seeds after 2-3 wk consumption (100g/day) constituted the prodromal symptoms of poisoning from granosan (ethyl-mercury chloride) - treated seeds in 10 workers, who had been handling such seed for 6 consecutive sowing seasons. Nausea, vomiting, diarrhea, high temperature and general weakness, which developed one week later, led to hospitalization. In contrast to literature data, the patients exhibited no hypotonia or bradycardia. However, the ECG's (I, II standard and left pectoral leads) revealed S-T segments below the isoelectric line in most of the patients; the presence of a distinct V-wave in 5 patients pinpointed the myocardial susceptibility to granosan. Hematological alterations included hypochromic anemia, leukocytosis and enhanced erythrocyte sedimentation rate. Normal total blood protein levels were associated with a certain degree of dysproteinemia, with 5.9% α_1-globulin, 8.8% α_2-globulins, 13.1% β-globulins, 14.4% γ-globulins and 12.9% fibrinogen; average albumin, 44.5%. Urine samples appeared to contain 0.02 to 0.05 mg/l of mercury. Most of the patients exhibited proteinuria, leukocyturia and microhematuria. Treatment with Unithiol and hyposulfite resulted in full recovery.

See also 72-0891 72-0893 72-0905 72-0909 72-0912 72-0940 72-0941 72-0946 72-0957 72-1008 72-1111

72-1001. Breazeale, F. W.; Camper, N. D. (Dept of Microbiology, Clemson U., Clemson, SC 29631). **Effect of selected herbicides on bacterial growth rates.** *Appl. Microbiol. 23(2): 431-432; 1972.* (7 references)

Specific growth-rate constants, calculated from standard dry weight curves and turbidity values, were used to evaluate the growth of three soil bacteria (*Erwinia carotovora, Pseudomonas fluorescens,* and a *Bacillus* sp.) in the presence of various herbicides. Inhibition of *E. carotovora* was noted in the presence of diquat and ioxynil at 25 μg/ml; paraquat at 50 μg/ml; and PCP at 10 μg/ml. *P. fluorescens* displayed growth inhibition in the presence of paraquat and PCP at 25 μg/ml. The *Bacillus'* growth was inhibited by diquat at 25 μg/ml, ioxynil at 10 μg/ml and paraquat and PCP at 5 μg/ml. The relatively nonpolar herbicides atrazine, trifluralin, fluometuron and diuron did not appreciably affect the growth rate of any of the organisms tested; they may be unable to penetrate the bacterial cell or inhibit surface activity. If the growth of the test organism was incompletely inhibited by the herbicide in question, a long lag phase followed by growth was observed, probably due to adaptation or mutant selection.

72-1002. Metcalf, R. L.; Kapoor, I. P.; Hirwe, A. S. (Author address not given) **Development of biodegradable analogues of DDT.** *Chemtech 2(2): 105-109; 1972.* (17 references)

Investigation of the possibility of producing biodegradable analogs of persistent insecticides began with a study of the metabolism of methoxychlor. The key steps to biodegradability were found to be the formation, by *O*-dealkylation, of first the monophenol and then the bisphenol. Subsequently, studies on methiochlor (2,2-bis-*p*-methylthiophenyl-1,1,1-trichloroethane) and methylchlor (2,2-bis-*p*-methylphenyl-1,1,1-trichloroethane) indicated that each compound could be attacked by the multifunction oxidases, which are not as abundant in insects as in vertebrates, stepwise forming increasingly polar moieties. Asymmetrical analogs of DDT, such as 2-(*p*-methoxyphenyl)-2-(*p*-methylthiophenyl)-1,1,1-trichloroethane, were synthesized and were found to be highly biodegradable and about as effective as DDT against test insects and even more active against a strain of resistant house flies. The possibility of producing a more desirable analog of DDT was confirmed in a model ecosystem in which concentration of insecticide in the food chain and the ratios of nonpolar to polar metabolites found in fish were considerably lower with the altered molecules.

72-1003. Shabad, L. M; Kolesnichenko; T. S. Nikonova, T. V. (Inst. of Experimental and Clinical Oncology of the Academy of Medical Sciences of USSR, Moscow, USSR). **The effect of transplacental administration of DDT on organ cultures of foetal mouse lung tissue.** *Int. J. Cancer 9(2): 365-373; 1972.* (16 references)

A possible blastomogenic effect of DDT was suggested by experiments in which 0.1 ml of the compound in sunflower-seed oil was administered orally to mice from about 6 to 8 weeks of age through lactation for several generations. Explants from 19 to 20 day fetal lungs showed intensified growth as compared to controls and diffuse and focal hyperplasia of epithelium, with some focal adenomatous growth. At a dose level of 10 ppm, cultures from the F1 generation had an 8.9% incidence of changes. Cultures from the F3 generation showed a 39.3% incidence of changes, approximately that percentage induced by 50 ppm in the F1 generation. In the F4 and F5 generations there was a slight decrease in hyperplastic changes and adenomatous outgrowths were more frequent. No adenomas were observed. In similar experiments on fetal lungs of rats and mice in which established carcinogens were administered, diffuse and focal hyperplasia preceded the appearance of adenomas.

72-1004. Hashimoto, Y. (Dept. of Soil Pesticides, Environment Agency, Tokyo, Japan). **[Toxicity of pesticides to birds. Part I.]** *Kongetsu No Noyaku (Agr. Chem. Mon.) 16(3): 86-90; 1972.* (Japanese)

Original test data on the toxicity of pesticides to birds, especially wild birds, are not available in Japan, and there are no legal restrictions on pesticide use with respect to effects on wild birds. The author, seeing the need for elucidating the possible harmful effects of pesticides to wild birds and of taking the necessary steps to protect them, reviews the test data obtained in foreign countries, mainly citing from "Ecological Effects of Pesticides on Non-Target Species", a U.S. Government publication. Specific references may be requested from the author. In this article, 37 insecticides are listed with their LD50 in mg/kg, mainly by oral administration, to some of the following birds: bobwhite quail, hen and chicken, chucker partridge, coturnix, house sparrow, lesser sandhill crane, mallard duck, mourning dove, turkey, peregrine falcon and common pigeon.

72-1005. Casper, H. H.; Pekas, J. C. (Dept. of Animal Science, North Dakota State U., Fargo, ND 58102). **Absorption and excretion of radiolabeled 1-naphthyl-*N*-methylcarbamate (carbaryl) by the rat.** *N. Dak. Acad. Sci. 24(Pt. 2): 160-166; 1971.* (12 references)

Following oral administration of 7.5 moles/kg of naphthyl-^{14}C carbaryl to female Sprague-Dawley rats, 84.4% of the ^{14}C label was absorbed in 24 hrs. An equivalent absorption was found following administration of carbonyl-^{14}C carbaryl. While an insignificant amount of ^{14}C dioxide was recovered when the naphthyl label was used, the carbamyl moiety was extensively degraded to carbon dioxide. Pyloric ligation resulted in a reduction of absorption to 51.2%. Ligation of the esophagus markedly reduced the total ^{14}C dioxide expired either by eliminating carbon dioxide produced in the lumen or by

reducing absorption through reduced saliva. Maximum expiration rates, strikingly similar after oral and intravenous doses of carbonyl-^{14}C carbaryl, peaked at 30 to 40 minutes indicating that absorption is rapid and probably occurs in the stomach or anterior portion of the small intestine.

72-1006. Larson, J. D.; Bakke, J. E. (Dept. of Biochemistry, North Dakota State U., Fargo, ND 58102). **Metabolism of plant metabolites of *s*-triazine herbicides in the rat.** *N. Dak. Acad. Sci. 24(Pt.2): 178-187; 1971.* (6 references)

Metabolism studies were performed using ring-labeled 2-methoxy-4-ethylamino-6-*sec*-butylamino-*s*-triazine (GS-14254)(I) and its probable plant metabolites 2-hydroxy-4-ethylamino-6-*sec*-butylamino-*s*-triazine(II), 2-hydroxy-4-*sec*-butylamino-6-amino-*s*-triazine(III) and 2-hydroxy-4-ethylamino-6-amino-*s*-triazine(IV). Most of the radioactivity from each compound was excreted in the urine, and no radioactivity was detected in animal bodies 72 hr post administration. With the parent compound (I), about 90% of the urinary metabolites had the ethyl group removed, but the ethyl group remained in the three characterized urinary metabolites from compound II. The hydroxy compounds were not converted to ammiline (2-methoxy-4-*sec*-butylamino-*s*-triazine), the major urinary metabolite of I. Although conjugation can occur with compounds III and IV, the basic structure is excreted in the urine unchanged.

72-1007. Aucamp, J. L.; Butcher, J. W. (Dept. of Entomology, Michigan State U., East Lansing, MI 48823). **Conversion of DDT to DDE by two mite species.** *Rev. Ecol. Biol. Sol 8(4): 635-638; 1971.* (4 references)

Fasted mites from two species, *Caloglyphus krameri* and *Rhizoglyphus robini*, were exposed to yeast containing DDT at 100 ppm for 24 hrs at 22°C. Mites were recovered, washed and macerated in hexane for gas chromatographic analysis. Quantitation based on peak areas indicated that *R. robini* was capable of only limited metabolism of DDT to DDE. The body concentration of DDT was 38 ppm, while <0.1 ppm DDE was detected. In *C. krameri*, concentrations were practically reversed, indicating a very high conversion. Although mites were collected from an area where DDT has been used extensively, the ability to metabolize DDT is probably a natural phenomenon because *C. krameri* is resistant to many pesticides.

72-1008. Janda, J. (Research Inst. of Forestry and Game-Keeping, Zbraslav, Czechoslovakia). **Ucinek pesticidnich latek na lovnou zver (metoda vyzkumu). [The effect of pesticides on game animals, methodology of study.]** *Agrochemia (Bratislava) 12(2): 51-53; 1972.* (6 references) (Czech)

Negative aspects of the use of pesticides in agriculture and forestry are considered, specifically their harmful effect on wildlife, the extent of which is not yet known. A method has been elaborated for assessing of the effects of individual pesticides on game animals, i.e., the toxicity and unpalatibility of feed treated with pesticides. A series of experiments was carried out on caged animals (pheasants, partridges, hares) with evaluation of experimental material by biological and chemical methods in the laboratory. The amount of pesticides that free animals can consume and the lethal doses of each pesticide were determined. The development of the poisoning symptoms was closely followed. Unpalatibility of the feed treated with pesticides was evaluated by comparison of consumption of feed with and without pesticides.

72-1009. Karczmar, A. G.; Nishi, S.; Blaber, L. C. (Dept. of Pharmacology and Inst. for Mind, Drugs and Behavior, Loyola U. Medical Center, Maywood, IL 60153). **Investigations, particularly by means of the anticholinesterase agents, of the multiple peripheral and central cholinergic mechanisms and of their behavioral implications.** *Acta Vitaminol. Enzymol. 24(4-5): 131-189; 1970.* (197 references)

Various anticholinesterase compounds have been used in elucidating the anatomical and functional characteristics of cholinergic synapses, as reviewed here. In the course of these studies it was found that the concept of organophosphates as the only irreversible cholinesterase inhibitors requires modification; carbamates and related nitrogenous anticholinesterases and sulfonates act in this manner as well. Structure-function relationships of organophosphorus insecticides and other compounds are discussed. Cholinergic agonists and antagonists, agents which block acetylcholine synthesis, and cholinesterase reactivators are also considered. Cholinergic drugs produce specific behavioral effects, but these cannot readily be predicted due to the complexity of the cholinergic synapses and their couplings.

72-1010. Bello, T. R.; Torbert, B. J. (Dept. of Veterinary Science, Louisiana State U., Baton Rouge, LA 70803). **Toxicity of an organic phosphate anthelmintic (Shell SD 15803) at excessive dosages in two-month-old pony foals.** *Amer. J. Vet. Res. 33(2): 329-334; 1972.* (10 references)

In two-month-old foals, four degrees of intoxication resulted from administration of the organophosphate anthelmintic Shell SD 15803 (2,2-dichlorovinyl methyl octyl phosphate) at doses of 27, 110, and 220 times the therapeutic dose: moderate intoxication with prompt recovery (1 foal); severe intoxication with prompt to moderate recovery (4 foals); severe intoxication with chronic gastrointestinal syndrome and death (1 foal); and severe intoxication with early death (3 foals). Fluid diarrhea occurred in all animals, particularly 3 to 4

hours after administration, and might have been partially due to the mineral oil used as a vehicle. Increased dosage resulted in increased gross damage to the gastrointestinal tract. Neurotoxicity ranged from transient central nervous system depression to muscular tremors, posterior ataxia, disorientation and convulsions. Rectal temperatures, and heart and breathing rates showed limited response in surviving foals, but responses were extreme in foals which died. Of the blood chemistry values studied, packed cell volume and ChE values were most significantly altered.

72-1011. McKinney, J. D.; Hawk, R. E.; Boozer, E. L.; Suggs, J. E. (National Inst. of Environmental Health Sciences, Research Triangle Park, NC 27709). **On the chemistry of the isomeric dichlorodiphenylacetaldehydes related to DDT. Stereoelectric effects in the hydrolysis of the cyclic acetals.** *Can. J. Chem. 49(23): 3877-3886; 1971.* (19 references)

The chemistry of the isomeric dichlorodiphenylacetaldehydes related to DDT was investigated to aid in delineating their possible role in the metabolism of this pesticide. In the case of the *p,p'*-isomer, the most important system under consideration, several literature syntheses were shown to be incorrect. The failure of at least one of these methods was attributed to the preferred oxidative involvement of the benzhydryl carbon via rearrangement of a β-hydroxy enol ether which normally led to the isolation of the *p,p'*-dichlorobenzophenone instead of the desired aldehyde. The *o,p'*-isomer exhibited chemistry similar to that of the *p,p'*-isomer although the steric effect of the ortho-substituted chlorine on the benzhydryl proton was notable. The *o,o'*-isomer was normal in that it did not undergo reactions involving the benzhydryl carbon. Some possible mechanistic and biological implications of the work are discussed. (Author abstract by permission)

72-1012. Nagasaki, H.; Tomii, S.; Mega, T.; Marugami, M.; Ito, N. (Dept. of Hygiene, Nara Medical U., Kashihara, Nara-ken 634, Japan). **Development of hepatomas in mice treated with benzene hexachloride.** *Gann (Jap. J. Cancer Res.) 62(5): 431; 1971.* (2 references)

In a chronic toxicity study, hepatomas, similar to those induced by other chemicals, were found in all 20 male dd mice fed an experimental diet containing 660 ppm benzene hexachloride for 24 weeks. No remarkable changes were seen in the livers of mice fed diets containing 66, 6 or 0 ppm benzene hexachloride over the same period.

72-1013. Gopinath, C.; Ford, E. J. H. (Dept. of Veterinary Clinical Studies, U. of Liverpool, Liverpool, England). **The effect of alpha-naphthyl isothiocyanate on the liver of sheep and calves.** *J. Pathol. 100: 269-280; 1970.* (17 references)

Administered in a single large dose, α-naphthyl isothiocyanate (ANIT) produces swelling, vacuolation and loss of particulate staining of periportal cells in calf and sheep livers. Reductions in glutamate dehydrogenase, succinic tetrazolium reductase and nonspecific esterase throughout the liver lobule were demonstrated by histochemical techniques. Changes in production and release of other enzymes were also noted, as was a reduction in BSP clearance and an elevation of serum bilirubin. Administration of α-naphthylisothiocyanate in small daily doses yielded similar changes, as well as additional liver damage as indicated by impairment of the albumin-globulin ratio and intravascular red cell breakdown. Only slight increases in portal fibrous tissue and very little bile duct hyperplasia were found in the treated ruminants, in contrast to previous findings in rodents, which displayed hyperplasia without liver damage.

72-1014. Denys, A.; Levy, J.; Michel-Ber, E. (Institut de Pharmacologie Laboratoire de Jeanne Levy, Paris, France). **Caractere de l'induction enzymatique provoquee chez la souris par le chlordane. I. - Traitements aigus et chroniques. [Character of the enzyme induction by chlordane in mice. I. - Acute and chronic treatments.]** *Therapie 26(5): 887-910; 1971.* (16 references) (French)

The conditions of reversibility of induction, and of the stabilization of a specific induction level as a function of the dosage and route of administration were studied in mice of both sexes and different ages. Chlordane and phenobarbital were used as inductors, and pentobarbital and zoxazolamine as effectors. Single doses of 30, 10 and 2.5 mg/kg, repeated doses of 3 X 25-1.25 mg/kg, and chronic doses of 2.5 mg/kg of chlordane were administered intraperitoneally. Chronic administration resulted in a progressive increase of the reactivity of mice to induction and a retardation of reversibility. A sharply reduced induction intensity was found after 17 weeks of age in chronic treatment; however, the older chronically treated mice were still far more receptive to induction than controls. The latency characteristic of the induction by chlordane may be explained by the rapid metabolism of chlordane and its principal metabolite, heptachlor, to the epoxide which is eliminated slowly from the adipose tissues.

72-1015. Hill, E. F.; Dale, W. E.; Miles, J. W. (Technical Development Labs., Center for Disease Control Health Serv. and Mental Health Admin., U.S. Public Health Serv., U.S. Dept. HEW, Box 2167, Savannah, GA 31402). **DDT intoxication in birds: subchronic effects and brain residues.** *Toxicol. Appl. Pharmacol. 20(4): 502-514; 1971.* (14 references)

After 5 days on *ad libitum* diets containing 25 to 800 ppm of technical DDT, the concentrations of DDT, DDE, and DDT (TDE) in the brains of farm-reared bobwhite (*Colinus virgianus*) could be correlated with die-

tary concentrations. Weight losses were significant when dietary concentrations reached 400 ppm but there were no other toxic signs. A diet of 800 ppm DDT produced mild signs of intoxication and total brain residues of 5.6 to 22.3 ppm. A diet containing 1600 ppm DDT caused severe toxic signs culminating in convulsions and death. Analysis of the brain showed an average concentration of DDD + DDT to be 28.4 ppm. The average concentrations of DDD + DDT in the various species were: house sparrows (*Passer domesticus*) 43.2 ppm; wild bobwhite, 31.3 ppm; farm-reared bobwhite, 28.4 ppm; cardinals (*Richmondena cardinalis*), 26.7 ppm; and blue jays (*Cyanocitta cristata*), 23.0 ppm. In bobwhite, cardinals, and blue jays concentrations in the brain ranging from 20 to 25 ppm strongly implicate DDT as the lethal agent. A concentration of 32.6 ppm in the brain of house sparrows was indicative of DDT poisoning. (Author abstract by permission)

72-1016. Shtenberg, A. I.; Orlova, N. V. (Inst. of Nutrition, USSR Academy of Medical Sciences, Moscow, USSR). **K voprosu o mekhanizme toksicheskogo deystviya sevina – pestitsida iz gruppy karbaminovykh soyedineniy. [Contribution to the mechanism of toxic action of Sevin, a pesticide of the carbamate group.]** *Vestn. Akad. Med. Nauk SSR 25: 72-76; 1970.* (14 references) (Russian)

In the course of extensive studies on various aspects of Sevin (carbaryl) toxicity, it was found that peroral administration of carbaryl to rats for 6 to 12 months at 0.7 to 70 mg/kg/day produced dose-dependent functional and morphological alterations in the endocrine system. Enhanced gonadotropic function of the hypophysis in treated animals was accompanied by alterations in the estrous cycle in females and impaired spermatogenesis in males. The effects of carbaryl administration were intensified when carbaryl was fed to successive generations of rats: increasingly impaired oogenesis and spermatogenesis developed within 6 months in the second, third and fourth generations of animals fed diets containing carbaryl at 2 or 5 mg/kg body weight. Certain ovarian and testicular enzyme activities were also depressed in treated animals. The adrenal glands displayed increased lipid and decreased ascorbic acid levels. Hyperthyroidism in the initial treatment stage, manifested by weight gains, proliferation of glandular epithelium, and elevated blood protein-bound iodine, was followed by a hypothyroid phase.

72-1017. Pliss, G. B. and Zabezhinskiy, M. A. (N.N. Petrov Research Inst. of Oncology of the USSR Ministry of Public Health, Leningrad, USSR). **O kantserogennykh svoystvakh proizvodnykh simmetrichnogo triazina. [Carcinogenicity of symmetric triazine derivatives.]** *Vop. Onkol. 16(1): 82-85; 1970.* (7 references) (Russian)

Low-level carcinogenicity of simazine and cyanuric acid was observed by feeding, subcutaneous administration and skin application of these compounds to white rats and CC57 mice. Cyanuric acid produced the highest tumor incidence (hepatoma) in rats following chronic oral treatment, and simazine induced development of sarcomas in both mice and rats at the injection site following subcutaneous treatment. Tumors occurred in 30% of the experimental animals, following an 18 month latency period. The carcinogenicity of the 2 compounds, which are so different in structure, can be attributed to the symmetric triazine ring.

72-1018. Merna, J. W.; Bender, M. E.; Novy, J. R. (Inst. for Fisheries Research, Michigan Dept. of Natural Resources, Ann Arbor, MI). **The effects of methoxychlor on fishes. I. Acute toxicity and breakdown studies.** *Mich. Dept. Natur. Resour. Res. Dev. Rep. 217, 1970, 15 p.* (11 references)

Two phases of a series of studies on the potential dangers from increased use of methoxychlor were reported: that of the half-life of the compound in various aquatic environments and that of acute toxicity of the compound. The half-life of methoxychlor was found to be in the range of 270 days. Hydrogen ion concentration was found to have no effect on the breakdown rate. Some error in the measurement was introduced by adsorption of methoxychlor on particles which settled and were missed in the sampling procedure. The static 96-hour TL50 values, 715 g/l for fathead minnows and 30.0 g/l for perch were much lower than lethal levels previously reported. It was suggested that the difference may be due to the use of a wetting agent to achieve better solution of methoxychlor. The results indicated that there is a very narrow tolerance level below which perch are able to metabolize methoxychlor with no mortality.

72-1019. Omirov, P. Yu.; Talan, K. A. (Samarkand Med. Inst., Samarkand, USSR). **K voprosu autoimmunizatsii u krolikov pri khronicheskom otravlenii geksakhloranom i metilmerkaptofosom. [Rabbit autoimmunization under conditions of chronic poisoning with hexachlorane (BHC) and methyl mercaptophos.]** *Med. Zh. Uzbek. 7: 11-12; 1970.* (Russian)

Autoimmunization following intragastric treatment with BHC or methyl mercaptophos (1 mg and 0.7 mg/kg/day respectively) was studied in rabbits. Methyl mercaptophos produced liver and kidney tissue autoantibodies in titers of 1:5 to 1:10 at 30, 45 and 60 days after the beginning of the experiment. BHC produced liver and kidney tissue autoantibodies within the first 10 days of the experiment. The initial titer of 1:40 decreased to 1:10 to 1:20, 18 days after the beginning of the experiment. Circulating liver tissue autoantibodies disappeared on the 24th day and reoccurred on the 45 to 60th days of the experiment, indicating the progressive nature of the autoimmunization process.

72-1020. Goncharuk, G. A. (A. A. Bogomolets Medical Inst., Kiev, USSR). **Eksperimental'noye issledovaniye vliyaniya pestitsidov gruppy rtut'organicheskikh soyedineniy na generativnuyu funktsiyu i potomstvo. [Experimental studies on the effects of organomercurial pesticides on the reproductive function and progeny.]** *Gig. Sanit. 36(7): 32-35; 1971.* (4 references) (Russian)

Albino rats and mice were exposed to ethyl mercurials (Granosan, Mercuran, Mercurhexane), phenylmercury acetate (PMA), or phenylmercury bromide before, and during various stages of pregnancy. The animals received 1/10 to 1/20 LD50, orally, or 50 to 80 times, or 100 to 150 times the limit dose concentrations by inhalation. The ethyl mercurials were more toxic than the phenyl mercurials. Ethyl mercury chloride caused delayed limb bone formation and was found in the gastrointestinal tract of the newborns. Phenyl mercurials did not alter blood-protein sulfhydryl groups as did the ethyl compounds, and no residues were detected in the progeny. Decreased fertility was noted in all treated animals in both the first and second generations.

72-1021. Aleksandrova, L. G.; Klisenko, M. A. (Research Inst. of Occupational Hygiene and Diseases, Kiev, USSR). **K voprosu o metabolizme proizvodnykh *N*-fenilkarbaminovoy kisloty v organizme teplokrovnykh zhivotnykh. [Metabolism of *N*-phenylcarbamic acid derivatives in warm-blooded animals.]** *Gig. Sanit. 36(8): 108-109; 1971.* (Russian)

Accumulation and distribution patterns of Carbyne (barban), isopropyl-*N*-phenylcarbamate (ICTP) and chloro-isopropyl-*N*-phenylcarbamate (chloro-IPC) in the rat were studied after a single intragastric administration of the maximum tolerable amount of the respective compound (250 mg/kg of Carbyne, 1g/kg of IPC, or 1.5 g/kg of chloro-IPC). Maximum Carbyne levels were found in the blood (2mg%), lung (3.5 mg%) and liver (6 mg%) 2 hours after administration and in heart (2 mg%) and spleen (4.3 mg%) 1 hour after treatment. The principal Carbyne metabolites, aniline, *m*-chloroaniline and oxycarbamate, appeared in liver and lung within 30 minutes after Carbyne administration; attainment of maximum levels and subsequent disappearance from the organs proceeded at different rates, depending on the metabolite in question. No trace of Carbyne was found in any organ 2 days after administration. The principal metabolites found after administration of IPC or chloro-IPC were aniline and *m*-nitroaniline. Small quantities of *p*-aminophenol were found in the urine of animals treated with any of the three compounds studied.

72-1021. Belova, R. S.; Sokolova, L. A. (Research Inst. of Rural Hygiene, Saratov, U.S.S.R.). **Toksikologo-gigiyenicheskaya otsenka gerbitsida 2,4-D γ maslyanoy kisloty s tochki zreniya gigiyeny pitaniya. [Toxicological and hygienic evaluation of 2,4-D γ butyric acid in terms of food hygiene.]** *Gig. Sanit. 36(11): 36-39; 1971.* (Russian)

When rats received subacute treatment with 2,4-D γ-butyric acid (2,4-DB), the compound demonstrated weak cumulative properties. Observation of a chronic treatment series showed the threshold dose for rats to be 3.4 mg/kg. Chronic administration produced weight decrease in males, but did not affect the weight of female rats. Impairment of glycogen synthesis by the liver was observed along with decreased ascorbic acid levels and protein -SH groups in liver, spleen and brain tissues. Following 320 days of chronic treatment, a 33% decrease in vitamin C was found in the adrenals; this was attributed to increased activity of the hypophyseal – adrenal system. Reproductive function in both male and female rats and in the first generation offspring was impaired. Teratogenic effects were observed in the third generation.

72-1023. Ivanova-Chemishanska, L. (Research Inst. for Occupational Protection and Diseases, Sofia, Bulgaria). **K toksikologii nekotorykh ditiokarbamatov. [Contribution on the toxicology of certain dithiocarbamates].** *Gig. Sanit. 36(11): 95-98; 1971.* (14 references) (Russian)

Oral administration of zineb, maneb, or mancozeb to albino rats indicated their lethal dose to be above 5g/kg, on the average. A cumulative coefficient of 3 was established for each of the three compounds after 4.5 months of treatment with 1/5 and 1/10 LD50 (p.o. twice/wk). Decreased mobility and loss of appetite and weight, followed by paralysis of the posterior limbs constituted general symptoms of poisoning following chronic p.o. treatment. Decreased iodine accumulation in the thyroid along with enhanced succinicdehydrogenase, cytochrome oxidase, peroxidase and acid phosphatase activities characterized the antithyroid action of these compounds. Embryotoxic and teratogenic effects (microencephaly, anencephaly) were observed following p.o. administration of 1/5, 1/10, or 1/20 LD50 of any of the above compounds. Inhalational exposure to maneb, zineb or mancozeb led to increased urinary ammonia and residual blood nitrogen levels. General alteration of the tissue respiratory process was deduced from the inhibition of most of the SH-group-containing enzymes. Higher doses of maneb produced necrotic areas within the hepatic lobules. Oxidoreductase enzymes were inhibited at the kidney level. Exposure to higher doses of zineb produced tracheal and bronchial mucosal hyperemia associated with lymphoid cell infiltrations, while ulcerative tracheitis developed from mancozeb. Mancozeb and zineb produced circulatory alterations within the lung, associated with local hemorrhages; emphysematous areas in the parenchyma were observed after maneb inhalation.

72-1024. Perelygin, V. M.; Shpirt, M. B.; Aripov, O. A.; Ershova, V. I. (Kirgiz Inst. of Epidemiology, Microbiology and Hygiene, Frunze, USSR). **Deystviye nekotorykh pestitsidov na immunologicheskuyu reaktivnost'. [Ef-**

fects of some pesticides on immunological reactivity.] *Gig. Sanit. 36(12): 29-33; 1971.* (3 references) (Russian)

The immunological reactivity of rabbits and albino rats was studied after chronic exposure to various pesticide doses. DDT, TMTD (Thiram) and Sevin (Carbaryl) at dosages of 0.1 mg/kg and zineb at 10 mg/kg did not produce any changes in immunological reactivity. However, DDT and TMTD at dosages of 0.5 mg/kg, carbaryl at a dosage of 20 mg/kg and zineb at a dosage of 100 mg/kg brought about a drop in the phagocytic activity of leukocytes, and in antibody formation and protective properties of the serum. Different phases of reactivity existed: an initial rise was followed by a drop in reactivity. DDT and TMTD at dosages of 1 mg/kg, carbaryl at 200 mg/kg, and zineb at 500 mg/kg caused a sustained, gradual drop in immunological responsiveness. These changes in reactivity are often accompanied by signs indicative of pathological alterations.

72-1025. Popov, T.; Basmadzhiyeva, K.; Kurchatova, G.; Davidkova, K.; Neykovska, L. (Research Inst. for Hygiene, Sofia, Bulgaria). **Kompleksnoye deystviye khimicheskikh agentov, zagryaznyayushchikh odnovremenno vodu i vozdukh. [The complex effect of chemical substances simultaneously polluting water and air.]** *Gig. Sanit. 36(12): 77-79; 1971.* (6 references) (Russian)

The composite biological effects of substances polluting both air and water were studied on the basis of dinitro-*o*-cresol. The maximum allowable concentrations in air, determined empirically, were 0.002 mg/m^3 (single exposure) and 0.0001 mg/m^{3}m (daily average). A maximum allowable concentration of 0.05 mg/l (i.e. 10^{-4} LD50) in water was suggested. To determine the doses and exposure times resulting in poisoning, tests were carried out on rats for 2 months. Doses of 0.005 mg/kg and 0.001 mg/m^3 were administered perorally and by inhalation, respectively, in two groups, while both routes of administration were combined in the third group (0.005 mg/kg and 0.001 mg/m^3). The test animals were examined 24 hours, and 10, 30 and 60 days after the beginning of exposure. No abnormalities were observed in behavior and weight of the animals, serum inorganic phosphorus contents, free sulfhydryl groups, erythrocyte, leucocyte and hemoglobin counts, catalase, peroxidase, blood cholinesterase, transaminases, phosphatase and lactate dehydrogenase activities. Thus the established levels appear to afford a reasonable margin of safety.

72-1026. Eliason, B. C.; Posner, H. S. (Box 12233, NIEHS, NIH, Research Triangle Park, NC 27709). **Placental passage of ^{14}C-dieldrin altered by gestational age and plasma proteins.** *Amer. J. Obstet. Gynecol. 111(7): 925-929; 1971.* (14 references)

In Sprague-Dawley rats, the concentration of radioactivity in maternal plasma at 5 min to 5 hr after administration of a single dose of 5 μc/kg of ^{14}C-dieldrin increased as gestation advanced. From day 13 to days 20 and 21 the fetal/maternal plasma radioactivity ratio decreased by only 28%, while the radioactivity ratios for maternal liver or placenta/maternal plasma decreased by more than 65%. Lowering the plasma concentration on the fetal side of the guinea pig placenta by *in situ* perfusion resulted in a decreased transfer of ^{14}C-dieldrin to fetal plasma. During perfusion of purified human protein fractions, the greatest transfer of ^{14}C-dieldrin occurred with the γ-globulin fraction. Fibrinogen, albumin and β-globulins gave intermediate results, and the γ-globulins were least effective in promoting transfer.

72-1027. Hood, R. D.; Bishop, S. L. (Dept. of Biology, U. of Alabama, Tuscaloosa, AL 35486). **Teratogenic effects of sodium arsenate in mice.** *Arch. Environ. Health 24: 62-65; 1972.* (14 references)

An increase in fetal deaths and resorptions was consistently found after intraperitoneal administration of a single dose of 45 mg/kg of sodium arsenate to Swiss-Webster mice on one of days 6 to 12 of gestation. Fetal growth, significantly retarded in animals treated on days 6 to 11, was particularly affected when arsenate was administered on days 7 and 9. Fetal abnormalities observed tended to be day-dependent. The most numerous malformations observed included: exencephaly, shortening of the jaws with consequent protrusion of the tongue, exophthalmos, open eye, umbilical hernia, shortened tail, and rib and vertebral defects. The most frequently observed internal defect was moderate hydrocephalus.

72-1028. Conney, A. H.; Chang, R.; Levin, W. M.; Garbut, A.; Munro-Faure, A. D.; Peck, A. W.; Bye, A. (Dept. of Biochemistry and Drug Metabolism, Hoffmann-La Roche Inc., Nutley, NJ 07110). **Effects of piperonyl butoxide on drug metabolism in rodents and man.** *Arch. Environ. Health 24(2): 97-106; 1972.* (30 references)

Piperonyl butoxide is a potent inhibitor of microsomal enzyme function in mice, as measured by this compound's ability to inhibit *in vivo* antipyrine metabolism and to prolong the actions of pentobarbital and zoxazolamine (Flexin). In rats, however, a very high dose of piperonyl butoxide is needed for inhibition of antipyrine and benzo[*a*]pyrene metabolism and for potentiation of pentobarbital and zoxazolamine action. Rats require more than a hundredfold higher dose of piperonyl butoxide than mice for inhibiting antipyrine metabolism. Studies in man revealed that oral administration of 0.71 mg of piperonyl butoxide per kilogram of body weight did not influence antipyrine metabolism. Since this dose is considerably greater than the daily exposure of individuals using sprays extensively in enclosed areas, it is unlikely that environmental exposure to piperonyl butoxide inhibits human microsomal enzyme function. (Author abstract by permission.)

72-1029. Murphy, S. D.; Cheever, K. L. (Dept. of Physiology, Kresge Center for Environmental Health, Harvard School of Public Health, 655 Huntingdon Ave., Boston, MA 02115). **Carboxylesterase and cholinesterase inhibition in rats.** *Arch. Environ. Health 24(2): 107-114; 1972.* (11 references)

Hydrolysis of diethyl succinate, methyl butyrate, and triacetin by rat liver carboxylesterases was inhibited *in vivo* and *in vitro* by the insecticide, Abate. Liver carboxylesterases were severalfold more sensitive to such inhibition than blood, brain, or submaxillary gland cholinesterases. Administration for eight weeks of 1 ppm Abate, the recommended concentration for mosquito larvicidal use in drinking-water containers, produced a small (20%), but consistent, inhibition of liver triacetin esterase. Abate at 5 ppm in drinking water for seven days inhibited liver carboxylesterases by 40% and increased rat susceptibility to the anticholinesterase action of a single 400-mg/kg dose of malathion, which is detoxified by carboxylesterases. Technical-grade Abate was about 100 times more potent as a carboxylesterase inhibitor *in vitro* than was a purified sample; however, *in vivo* differences in carboxylesterase-inhibiting potency were small. (Author abstract by permission.)

72-1030. Bogolyubova, G. M.; Karpinskaya, Ye. V.; Kulikova, A. I.; Rozengart, V. I. (I.P. Pavlov Inst. of Medicine, Leningrad, USSR). **Zashchitnyy effekt substratov pri ingibirovanii razlichnykh kholinesteraz fosforganicheskim ingibitorom. [Protective effect of substrates during inhibition of various cholinesterases with an organophosphorus inhibitor.]** *Biokhimiya 36(5): 1075-1081; 1971.* (16 references) (Russian)

The effects of the organophosphorus cholinesterase-inhibiting compound GD-7 (*O*-ethyl-*S*-(ethylmercaptoethyl)-methylthiophosphonate) on acetylcholinesterase obtained from bovine erythrocytes, butyrylcholinesterase obtained from horse blood serum, and the cholinesterase from the optical ganglion of Pacific Ocean squid were examined in the presence of various concentrations of such substrates as acetylcholine, propionylcholine and butyrylcholine. The substrates reduced the rates of reaction of the inhibitor with all the cholinesterases in a concentration-dependent manner, expressed by the degree of enzyme saturation. The primary protective effects of the various substrates are essentially similar for acetylcholinesterase and butyrylcholinesterase, whereas in the case of the squid cholinesterase, the primary protective action of acetylcholine is distinctly superior. It appears that acylation may limit hydrolysis of butyrylcholine by both squid cholinesterase and butyrylcholinesterase, while deacylation may limit hydrolysis of acetylcholine and propionylcholine. (Author abstract edited).

72-1031. Torre, C. (Istituto de Anatomia Umana Hormale Dell' Universita di Torino, Italy). **Azione del DFP sull'embrione di pollo. Prime osservazioni. [The action of DFP on chicken embryo. First observations.]** *Boll. Soc. Ital. Biol. Sper. 46(10): 523-526; 1970.* (5 references) (Italian)

Chicken embryo mortality from acute treatment with constant DFP (diisopropylfluorophosphate) doses (0.5 mg/incubated egg) was studied through the 15th day of incubation. Mortality was absent through the fifth day, low during the sixth to seventh days, considerable during the eighth to ninth days and equal to that of adult chickens on the tenth day of incubation. Death usually occurred within 8 hr following DFP administration. Following DFP inoculation, cholinesterase activity decreased within five to ten min and dropped to zero with 15 min; a zero level was maintained until the death of the embryo. Surviving embryos showed renewal of weak cholinesterase activity at 24 hr and normal levels at 29 hr following DFP inoculation. A parallelism between increasing DFP lethality and the development stage of cholinergic structures is pointed out.

72-1032. Kacew, S.; Singhal, R. L.; Ling, G. M. (Dept. of Pharmacology, U. of Ottawa, Ottawa, Canada KIN6N5). **DDT-induced stimulation of key gluconeogenic enzymes in rat kidney cortex.** *Can. J. Biochem. 50(2): 225-229; 1972.* (22 references)

Intramuscular injection of 100 mg/kg *o,p'*-DDT in rats resulted in increases in pyruvate carboxylase, phosphoenolpyruvate carboxykinase, fructose-1,6-diphosphatase, and glucose-6-phosphatase values to 298%, 273%, 300% and 298% of those of the controls respectively. The *p,p'*-DDT isomer resulted in a smaller rise in these enzyme activities, whereas the rise produced by technical DDT (a mixture of these two isomers) generally fell between that for the isomers themselves. These increases occurred within two to three days after DDT administration. Neither adrenalectomy nor concurrent administration of triamcinolone affected the increase produced in these renal gluconeogenic enzymes by DDT administration, thus indicating that the effect on the kidney is a direct one. Hepatic gluconeogenic enzyme activity was also significantly enhanced by DDT administration.

72-1033. Helson, L.; Wollner, N.; Murphy, L.; Schwartz, M. K. (Memorial Hospital for Cancer and Allied Diseases, New York, NY 10021). **Metastatic adrenal cortical carcinoma: biochemical changes accompanying clinical regression during therapy with *o,p'*-DDD.** *Clin. Chem. 17(12): 1191-1193; 1971.* (7 references)

Bilateral lung metastases, an abdominal mass, virilism, advanced bone age and elevated 24-hr urinary ketosteroids were found in a 10-yr-old girl 42 months after removal of an adrenal carcinoma. Treatment with *o,p'*-DDD (TDE) at a maintenance dose of 7.5 g/day and replacement therapy with 9-α-fluoro-hydrocortisone and cortisone acetate resulted in the disappearance of almost all symptoms and normalization of urinary steroids.

After administration of 240 g of *o,p'*-DDD, the abdominal mass and lung lesions regressed and urinary ketosteroids and hydroxysteroids decreased. During 42 months of treatment 9 kg of the drug were administered without discernible side effects. Systems most likely to be affected by *o,p'*-DDD were examined and reviewed. Serial electroencephalograms changed to normal from bilateral cerebral dysfunction, and I. Q. was 82. The patient demonstrated an unusual concern with bodily functions. Normal sexual development took place, although the deep voice persisted and menstrual periods occurred irregularly. Serial pituitary gonadotropin assay results were within the range of pubertal normal. Pulmonary function remained borderline low-normal, and hemoglobin returned to normal.

72-1034. Cooke, A. A. (The Nature Conservancy, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Great Britain). **The effects of DDT, dieldrin and 2,4-D on amphibian spawn and tadpoles.** *Environ. Pollut. 3(1): 51-68; 1972.* (22 references)

The effects of DDT, dieldrin and 2,4-D on spawn and tadpoles of the common frog (*Rana temporaria*) and tadpoles of the common toad (*Bufo bufo*) and smooth newt (*Triturus vulgaris*) during their development were examined by placing the spawn or tadpoles for 24 or 48 hr in amphibian saline containing the pesticides. The spawn or tadpoles were transferred to fresh saline after the desired time, and their development observed for three weeks. DDT penetrated freshly laid spawn but not well-developed spawn; following penetration into spawn, it was detected in hatching tadpoles. These tadpoles became hyperactive upon losing their gills. They were most susceptible to DDT just before or just after developing hind limb buds with hyperactivity setting in when tissue DDT concentrations reached 2 to 4 ppm. Tissue residues of DDT acquired by small frogs during development caused latent mortality during tail resorption. DDE was detected in some of the young amphibians after DDT treatment. Dieldrin produced behavioral and morphological abnormalities, but they were less marked than those after DDT. No perceptible effects and no tissue residues were noted in frog tadpoles kept in saline containing 50 ppm 2,4-D for 48 hours.

72-1035. Juszkiewicz, T.; Rakalska, Z.; Dziersawski, A. (Laboratory of Pharmacology and Toxicology, Veterinary Inst., Pulawy, Poland). **Effet embryopathique du chlorure de chlorocholine (CCC) chez le hamster dore. [Embryopathic effect of chlorocholine chloride (CCC) in the golden hamster.]** *Eur. J. Toxicol. 3(5): 265-270; 1970.* (14 references) (French)

The plant growth regulator chlorocholine chloride (CCC) was administered orally in single doses of 400, 300, 200, 100, 50, and 25 mg/kg to pregnant hamsters on the 8th day of gestation, and 100 mg/kg three times, on the 7th, 8th and 9th days of gestation. The female hamsters were killed on the 14th day of gestation, two days before the normal littering time. Implantations, resorptions, living fetuses, dead fetuses, deformed fetuses and underdeveloped fetuses were counted, and the fetal weights and lengths measured. The fetuses were then fixed in formalin or stained with alizarin red and examined for internal and skeletal malformations. Maternal mortality occurred in the highest dosage group, and some symptoms were manifested in the 300 mg/kg group. Significant numbers of dead, malformed and underdeveloped fetuses were found in the groups given 400, 300 or 200 mg/kg (single dose), and an elevated incidence of malformed fetuses in the group given three doses of 100 mg/kg. Fetal weight and length was reduced in the three highest dosage groups, but was significantly elevated in the 25 mg/kg group. The observed malformations primarily affected the nervous system.

72-1036. Matin, M. A.; Kar, P. P. (Industrial Toxicology Research Centre, Chatter Manzil Palace, Lucknow, U. P., India). **Effect of cholinesterase inhibitors and PAM on the release of acetylcholine from isolated guinea pig ileum.** *Jap. J. Pharmacol. 21(5): 563-567; 1971.* (20 references)

The effects of four anticholinesterases at 1×10^{-5} g/ml on the spontaneous release of acetylcholine were studied using a guinea pig ileum assay method. Eserine, which inhibits both butyrylcholinesterase and acetylcholinesterase, and prostigmine (both carbamates) afforded the best protection for acetylcholine. In the presence of the two organophosphates, phosphamidon and mipafox (a butyrylcholinesterase inhibitor), accumulation was lowest. When the compounds were tested in the presence of PAM at 0.01 and 0.1 mM, the order of effectiveness was retained, but less acetylcholine was released in each case.

72-1037. Taljaard, J. J. F.; Shanley, B. C.; Joubert, S. M. (Dept. of Chemical Pathology, Faculty of Medicine, U. of Natal, Durban, Natal, Union of South Africa). **Decreased uroporphyrinogen decarboxylase activity in "experimental symptomatic porphyria".** *Life Sci. (Pt. II) 10(15): 887-893; 1971.* (17 references)

Previous studies have shown that administration of excessive quantities of iron to rats, followed by administration of hexachlorobenzene (HCB), rapidly results in the development of a syndrome which closely resembles human symptomatic porphyria. Animals treated in this manner in the present studies displayed a sharp rise in urinary porphyrin excretion (from about 4 μg/rat/24 hr initially to 275 μg/rat/24 hr at day 55), beginning about 33 days after the onset of HCB administration. A similar increase began later in animals given only HCB. A shift toward the higher carboxylated porphyrins was also noted. Storage of 7- and 8-carboxyl porphyrins was noted in animals treated with Fe-HCB and HCB alone, averaging 544 μg/g liver weight in the former and 130

μg/g in the latter. Uroporphyrinogen decarboxylase activity in the livers of rats treated with HCB alone was similar to that in untreated rats, but in the case of the Fe-HCB rats, no activity of this enzyme could be detected. In connection with the increase in total urinary coproporphyrin excretion in the FE-HCB animals as well as human patients with symptomatic porphyria, this suggests that in addition to the decreased decarboxylation as measured here, some process favoring increased oxidation of porphyrinogens to porphyrins is operating.

72-1038. McBain, J. B.; Yamamoto, I.; Casida, J. E. (Div. of Entomology, U. of California, Berkeley, CA 94720). **Oxygenated intermediate in peracid and microsomal oxidations of the organophosphothionate insecticide Dyfonate.** *Life Sci. (Pt. II) 10(22): 1311-1319; 1971.* (12 references)

Dyfonate is oxidized to the respective oxon by *m*-chloroperbenzoic acid in dichloromethane or by the mixed-function oxidase system of hepatic microsomes. Products of the oxidation of ^{14}C-Dyfonate, labeled in either the phenyl or ethoxy positions, were separated by thin-layer chromatography on silica gel. Structures of the metabolites were confirmed by infrared and proton magnetic resonance spectra. The reaction of Dyfonate with either the peracid or the mixed-function oxidase system to which NADPH had been added resulted in a mixture of Dyfonate, its oxon, *O*-ethyl *S*-phenyl ethylphosphonothiolate (ETP), *O*-ethyl ethylphosphonic acid (EOP), and thiophenol. In addition, a novel oxidation product (oxygenated Dyfonate), the spectral analysis of which indicated a single oxygen introduced at the thionophosphorus moiety without any other molecular modifications, was found in 30% yield. Formation of this intermediate and its subsequent hydrolysis explain the formation of ETP, EOP and thiophenol but not the conversion to Dyfonate oxon. The formation of a transient intermediate that is converted either to the oxon or to oxygenated Dyfonate is postulated.

72-1039. Bailey, S.; Bunyan, P. J. (Pest Infection Control Laboratory, Ministry of Agriculture, Fisheries and Food, Tolworth, Surbiton, Surrey, England). **Interpretation of persistence and effects of polychlorinated biphenyls in birds.** *Nature (London) 236(5340): 34-36; 1972.* (12 references)

Results of 20 to 28 day feeding studies with Aroclor 1242 and Aroclor 1254 suggest that pigeons and quail metabolize polychlorinated biphenyls at a rate generally proportional to the amount of chlorine in the molecule. Gas chromatography of samples extracted from heart or breast muscle, liver, brain, and omental fat of animals sacrificed 0, 28, 56, and 168 days after withdrawal of treated food showed an immediate distribution similar to that in pigeons fed DDT, but residues were five to ten times higher and the half-life of residues was much greater. In birds fed Aroclor 1254, residues were generally twice those of Aroclor 1242. Measurement of microsomal protein and cytochrome P450 indicated that Aroclor 1254, containing the more highly chlorinated biphenyls, is the most potent inducer of microsomal enzymes.

72-1040. Ishii, Y. (Dept. of Legal Medicine, Kumamoto U. Medical School, Kumamoto, Japan). **[Studies on chronic toxicity of organomercuric pesticides. Distribution of mercury in rats following prolonged oral administration of organomercuric pesticides.]** *Nippon Hoigaku Zasshi (Jap. J. Leg. Med.) 25(1): 27-37; 1971.* (51 references) (Japanese)

At 3 month intervals up to 24 months, the mercury content of organs, urine and feces of young male rats was measured following oral administration of Ruberon (lignisan), and Sanmicron (PMA) twice weekly in a dose of 1/100 LD50. In the group given Sanmicron, 78.5 to 99.5% of the dose was excreted. Mercury accumulated in the kidneys, with a peak concentration occurring at 21 months. Those animals receiving Ruberon excreted 67.2 to 78.2% of the dose, and accumulated mercury in the kidneys, liver, blood, and hair. The accumulated amounts of mercury in the kidneys after Ruberon continued to rise up to 18 months and were about twice as high as those for the arylmercurial.

72-1041. Waseda, Y. (Dept. of Legal Medicine, Kumamoto U. Medical School, Kumamoto, Japan). **[Studies on the mechanism of toxic actions of organochloric pesticides, drin compounds.]** *Nippon Hoigaku Zasshi (Jap. J. Leg. Med.) 25(1): 64-80; 1971.* (52 references) (Japanese)

In order to elucidate the mechanisms of the toxic effects of the organochlorine insecticides endrin, aldrin, and dieldrin on the central nervous system, the metabolism of rat cerebral cortex slices in the presence of these substances was investigated and compared with *in vivo* metabolic effects. In some cases, the effects observed at high concentrations *in vitro* were opposite to those observed *in vivo*, whereas the effects at lower concentrations *in vitro* were similar to the *in vivo* effects. This is true in the case of aerobic and anaerobic lactic acid formation (enhanced *in vivo*). At low concentrations *in vitro*, these pesticides increase the levels of free aspartic acid, glutamic acid, glutamine and γ-aminobutyric acid; high pesticide concentrations reduce these levels. *In vivo*, all three of the pesticides increase aspartic acid and glutamine levels while reducing glutamic and γ-aminobutyric acids. Tissue respiration is enhanced *in vivo* but inhibited *in vitro* and phosphatidyl ethanolamine levels rise while phosphatidic acid levels drop both *in vitro* and *in vivo*, in the presence of endrin, aldrin, and dieldrin.

72-1042. Takahama, K.; Ishii, Y.; Kanda, M. (Dept. of Legal Medicine, Kumamoto U. Medical School, Kumamoto, Japan). **Toxicological studies on organochlorine pesticides. Report 1. Effects of long term administration of organochlorine pesticides on rabbit body weight and organ weight.** *Nippon Hoigaku Zasshi (Jap. J. Leg. Med.) 26(1): 5-10; 1972.* (12 references)

Three organochlorine pesticides representing different chemical types, i.e., endrin, lindane and DDT, were administered to rabbits at 0.1, 6.25 and 50 mg/kg respectively each time, twice a week, via gastric catheter. The animals were weighed once a week for 25 weeks; organ weights of animals from each group were determined at one, three and six months after the beginning of the experiment. A slight decrease in the ratio of liver weight to body weight was found after the administration of each of the three pesticides for one month. The increase in body weight with advancing time was clearly accelerated in the case of the organochlorine insecticide-treated groups, in the order of endrin > DDT > lindane. Organ weight trends could not be followed with certainty, since differences were within the range of experimental error.

72-1043. Rubenchik, B. L.; Gorban, G. P. (Inst. Nutritional Hygiene of the Health Ministry of the Ukrainian USSR, Kiev, USSR). **Nabukhaniye i ATF-aznaya aktivnost' mitokhondriy pecheni krys pri vvedenii razlichnykh gepatokantserogenov. [Rat liver mitochondrial swelling and ATPase activity following administration of various hepatocarcinogens.]** *Tsitologiya 12(5): 678-681; 1970.* (11 references) (Russian)

To assess the carcinogenic hazard of the urea-derived herbicide monuron, its effects on mitochondrial swelling and ATPase activity in the rat were compared with those of the known hepatic carcinogens, *p*-dimethylaminoazobenzene (DAB) and thioacetamide (TIO). A slight decrease in mitochondrial swelling compared to that of controls took place with the carcinogens, and a greater decrease with monuron. On the other hand, whereas monuron produced a reduction in ATPase activity as well, this activity was enhanced by DAB and TIO. The increased activity makes the mitochondrial ATPase less accessible to metal-ion activators, such as calcium and magnesium ions.

72-1044. Gzhegotskiy, M. I.; Doloshitskiy, S. L. (L'vov Med. Inst., Dept. of General Hygiene, Lvov, USSR). **Kozhno-rezorbtivnoye deystviye gerbitsidov. [Skin absorption effects of herbicides.]** *Vrach. Delo 11: 133-134; 1971.* (Russian)

A single application of Avadex (diallate), Carbyne (barban), trichloro-propionitrile (TCP), or Alicep (pyrazon plus chlorbufam) to a shaven area of rabbit skin produced local irritation and swelling, followed in 5 to 10 days by necrosis and sloughing. No local alterations were produced by a single skin application of Dicotex (MCPA), pyrazon, celatox, propazine, dichloralurea (DCU) or sodium trichloroacetate (TCA). Extremely severe effects were seen after chronic topical treatment of rat tails with alicep and TCA: tail necrosis and dropping off of 8-cm tail segments occurred after 2 weeks of treatment. Skin treatment with TCP, TCA, pyrazon, dicotex, Alicep and the carbamate herbicides was followed by absorption, resulting in peripheral blood changes such as neutrophilic leukocytosis, decreased erythrocyte and hemoglobin levels, increased coagulation time and reduced peroxidase activity. In addition, cholinesterase activity was lowered after treatment with the carbamates. Ocular application of these same herbicides resulted in acute keratoconjunctivitis in guinea pigs and rabbits.

72-1045. Froeslie, A. (National Veterinary Inst., Oslo, Norway). **The difference in methaemoglobin formation by 6-amino metabolites of DNOC and DNBP in ruminant and nonruminant animals with special reference to sheep and swine.** *Acta. Pharmacol. Toxicol. 30(3-4): 238-247; 1971.* (14 references)

The methemoglobin-producing effects of 6-amino-4-nitro-*o*-cresol (6-ANOC), 6-amino-4-nitro-2-*sec*-butylphenol (6-ANBP) and the corresponding acetamides, derived respectively from DNOC and from DNBP (a dinobuton-derived compound) were tested in sheep and swine. None of these had any effect in swine, and 6-ANOC had only a weak effect in sheep, following intraperitoneal administration. Any of these metabolites administered intraruminally, however, produces methemoglobinemia in sheep. The effect of 40 mg/kg of 6-ANOC intraruminally was moderate, whereas sheep given similar molar doses of 6-ANBP displayed severe toxic symptoms, including protracted methemoglobinemia and hemolysis. Acetylation of 6-ANOC occurred after intraperitoneal administration in sheep and swine, but 6-ANBP was not acetylated under similar conditions. Thus methemoglobin production in sheep following administration of 6-ANOC and 6-ANBP (and probably of DNOC and DNBP as well) requires metabolic transformation in the rumen, probably to the diaminophenol derivatives which are found only in ruminants.

72-1046. Zimmer, M.; Klein, W. (Institut fuer Oekologische Chemie, Schloss Birlinghoven, Gesellschaft fuer Strahlen- und Umweltforschung m. b. H., Munich, Germany). **Beitraege zur oekologischen Chemie XXXVII. Rueckstandsverhalten und Umwandlung von *p,p'*-DDT-^{14}C und seiner Analogen *p,p'*-DDE-^{14}C und *p,p'*-DDD-^{14}C in hoeheren Pflanzen. [Contributions to ecological chemistry XXXVII. Residue behavior and transformation of *p,p'*-DDT-^{14}C and its analogs *p,p'*-DDE-^{14}C and *p,p'*-DDD-^{14}C in higher plants.]** *Chemosphere 1(1): 3-6; 1972.* (8 references) (German)

Radiolabeled DDT was applied to the top sides of

the leaves of cabbage and spinach plants in a single dose (2 mg/plant and 1 mg/plant respectively) or to cabbage at 1.5 mg/plant/application in four weekly applications. About 77% of the radioactivity remained in and on the treated spinach leaves after 18 days. Fourteen weeks after the single-dose DDT application in cabbage, 66% of the radioactivity was still present on the leaves; after the four-dose application, the amount of radioactivity recovered was similar, but this time, more than 6% was in untreated parts of the plants. About 2% of the radioactivity in the spinach and 5% in the cabbage was present in chemically altered form. Even less of the DDE applied underwent similar transformation, i.e., about 1%. About 10% of the DDD (TDE) was converted. The following derivatives were isolated from the plants treated with *p,p'*-DDT-^{14}C: DDE, TDE, DDMU, DDA, DDA conjugates and a DBH conjugate, in addition to several unidentified products. DDE and DDMU were present in and on the treated leaves, and the others only within the leaves. All of the transformation products obtained after treatment with *p,p'*-DDE-^{14}C were highly polar, and their thin-layer chromatographic properties changed after hydrolysis.

72-1047. Bakke, J. E.; Shimabukuro, R. H.; Davison, K. L.; Lamoureux, G. L. (U.S. Dept. of Agriculture, Animal Science Research Div., ARS, Metabolism and Radiation Research Lab., Fargo, ND 58102). **Sheep and rat metabolism of the insoluble ^{14}C-residues present in ^{14}C-atrazine-treated sorghum.** *Chemosphere 1(1): 21-24; 1972.* (7 references)

Atrazine, radiolabeled in the triazine ring, is gradually converted by corn and sorghum plants into an unidentified residue which cannot be extracted from the plants with methanol. To study the fate of this residue in animals, sorghum plants were grown in an atrazine-containing medium. The shoots were then extracted with methanol, and the insoluble residue incorporated into the diets of sheep and rats. Urine, feces and expired air from a sheep given a single dose (17.6×10^6 dpm activity) of the radioactive residue were collected for 48 hr and analyzed, as were urine and feces (72 hr), and carcasses from two rats given 3.6×10^5 dpm in a residue dose. Less than 0.5% of the radioactivity appeared in the air exhaled by the sheep, 6% in the urine, and the remainder in the feces. Fecal excretion by the rats averaged 90%, and urinary excretion, 2%. None of the radioactivity in the feces of either animal species could be extracted with methanol. The results suggest that the insoluble compounds into which the heterocyclic triazine ring is incorporated by plants also pass through the animal body unchanged, and thus back into the environment.

72-1048. Walker, E. M.; Gadsden, R. H.; Atkins, L. M.; Gale, G. R. (Dept. of Biochemistry, Medical U. of South Carolina, Charleston, SC 29401). **Some effects of 2,4-D and 2,4,5-T on Ehrlich ascites tumor cells *in vivo* and *in vitro*.** *Ind. Med. Surg. 41(1): 22-27; 1972.* (8 references)

Injection of 45, 65, 75, or 77 mg/kg/day of 2,4-D for 5 or 6 days, or 62, 78, 80, or 85 mg/kg/day of 2,4,5-T for 6 days into rats bearing Ehrlich ascites tumors was followed by a slight inhibition of tumor development in comparison to controls. At equivalent dose levels, 2,4,5-T appeared to be slightly more effective than 2,4-D, and the effect was apparently dose-dependent. The average survival times of the mice were increased approximately 40% by 2,4,5-T and 25% by 2,4-D. In investigations of RNA adenine and guanine synthesis employing radiolabeled sodium formate, 2,4,5-T produced approximately 30% inhibition of these syntheses if injected 48 hours after the labeled compound. Both 2,4-D and 2,4,5-T slightly enhanced the incorporation of radioactive precursors into DNA, RNA and protein in Ehrlich ascites cells *in vitro*.

72-1049. Agalides, E. (Electro Dynamic Div., General Dynamics, Pomona, CA). **The effect of organophosphorus insecticides on the nervous system of vertebrates.** *Inst. Environ. Sci. Tech. Meet. Proc. 17: 270-277; 1971.* (24 references)

The effects of the insecticide, malathion, on the electric fish, *Sternarchus albifrons*, were investigated. Apparatus used for recording the temperature of the water tank and the variations in the electrical discharge pulse rate emitted by the electric fish is described in detail. Electric fish were placed in aged tap water with a concentration of 5 mg/l malathion. The repetition rate of the electrical signal emitted by the fish was recorded before introducing the pesticide and at half-hour intervals thereafter for a period of two hours. All of the six fish developed incoordination in movements, failed to eat, and died within a few weeks. Both peripheral and central nervous system disorders are also seen in humans poisoned by organophosphate pesticides.

72-1050. Elliott, M.; Janes, N. F.; Kimmel, E. C.; Casida, J. E. (Div. of Entomology, U. of California, Berkeley, CA). **Metabolic fate of pyrethrin I, pyrethrin II, and allethrin administered orally to rats.** *J. Agr. Food Chem. 20(2): 300-313; 1972.* (28 references)

The oral administration of radio-labeled pyrethrin I, pyrethrin II, and allethrin to rats produces several urinary metabolites, identified by chromatographic and spectroscopic analyses. Each isolated metabolite contains a *trans*-2-carboxyprop-1-enyl side chain resulting from oxidation of the chrysanthemate isobutenyl group or hydrolysis of the pyrethrate methoxycarbonyl group. Also, the *cis*-2',4'-pentadienyl side chain of pyrethrin I and pyrethrin II is modified to give a *cis*-4',5'-dihydroxypent-2'-enyl group, a 4' conjugate of this diol, or a *trans*-2',5'-dihydroxypent-3'-enyl group. Allethrin is oxidized not only at the chrysanthemate isobutenyl moiety but also at the allyl group to the 1'-hydroxyprop-2'-enyl and 2',3'-dihydroxypropyl deriva-

tives, or at a methyl on the cyclopropyl moiety to a hydroxymethyl derivative. Allethrin gives some chrysanthemum dicarboxylic acid and allethrolone. Rapid detoxification in mammals by these metabolic pathways is probably an important factor in the selective toxicity of pyrethroids. (Author abstract reprinted by permission of the American Chemical Society)

72-1051. Sacher, R. M.; Olin, J. F. (Agricultural Div., Monsanto Co., St. Louis, MO 63166). **The insecticidal and the anticholinesterase activity of *meta*-acylamidophenyl and *meta*-thioureidophenyl *N*-methylcarbamates.** *J. Agr. Food Chem. 20(2): 354-359; 1972.* (11 references)

Fifty-nine new *N*-methyl and *N,N*-dimethylcarbamates were synthesized and tested as insecticides and as inhibitors of fly and bovine cholinesterases. In spite of the high anticholinesterase activity exhibited by many of these compounds, only a few chemicals have shown insecticidal activity; performance was not improved by the synergist 2,3-methylenedioxynaphthalene in most cases. The structure-activity correlation revealed that maximal cholinesterase activity is associated with a definite size of the alkyl substituent on the amide or the thiourea grouping. In all series tested, alkyl substitutents with four to six carbon atoms produced the most potent inhibitors for both fly and bovine cholinesterase. Structure-activity correlations were less pronounced in the case of the bovine cholinesterase because of the generally weak inhibitory activity against this enzyme. Most compounds were 10 to 800 times less effective against bovine cholinesterase than against fly cholinesterase. (Author abstract modified; reprinted by permission of the American Chemical Society).

72-1052. Dailey, R. E.; Klein, A. K.; Brouwer, E.; Link, J. D.; Braunberg, R. C. (Div. of Toxicology and Chemical Technology, Food and Drug Admin., Dept. of HEW, Washington, DC 20204). **Effect of testosterone on metabolism of ^{14}C-photodieldrin in normal, castrated and oophorectomized rats.** *J. Agr. Food Chem. 20(2): 371-376; 1972.* (8 references)

Subacute levels (5 μg per day) of ^{14}C-labeled photodieldrin were administered orally to normal adult rats of both sexes and to rats that had been castrated or oophorectomized within 3 days of brith. Urinary and fecal excretion patterns of ^{14}C activity were determined before and after administration of testosterone to all of the rats. Testosterone greatly enhanced excretion of ^{14}C-labeled metabolites in control females and sex hormone-deficient groups. The major metabolite found in the urine of these animals after testosterone treatment was ^{14}C-ketodieldrin, which was present in only trace amounts before the steroid was given. Testosterone did not affect the levels of ^{14}C-ketodieldrin excreted by control males. Tissue levels of ^{14}C activity in females and sex hormone-deficient males and females after 6 weeks of testosterone administration were comparable to those found in control males. The highest concentrations of ^{14}C activity were found in the kidneys of all four groups. High levels of labeled compounds found in biopsy samples of adipose tissue from females and sex hormone-deficient groups before testosterone administration were not evident at autopsy. (Author abstract reprinted by permission of the American Chemical Society).

72-1053. Nowicki, H. G.; Wong, R. G.; Myrtle, J. F.; Norman, A. W. (Dept. of Biochemistry, U. of California, Berkeley, CA 94720). **Inhibition of biological activity of cholecalciferol (Vitamin D_3) by *o,p'*-DDT or *p,p'*-DDT in rachitic cockerel.** *J. Agr. Food Chem. 20(2): 376-380; 1972.* (39 references)

Considerable evidence suggests that chlorinated hydrocarbons cause thin eggshell formation, apparently in part through an altered calcium metabolism of adult birds and thus reproductive failure in raptors. This report concerns a comparative study of some of the known biological effects of cholecalciferol (vitamin D^3), a major steroid regulator of Ca^{2+} metabolism, in *o,p'*-DDT [1,1,1-tri-chloro-2-(*o*-chlorophenyl)-2-(*p*-chlorophenyl)ethane], or *p,p'*-DDT [1,1,1-trichloro-2,2-bis(*p*-chloro-phenyl)ethane] treated and untreated rachitic chicks. It was found that *o,p'*-DDT or *p,p'*-DDT treatment decreased the normal cholecalciferol (CC) mediated increase in intestinal calcium absorption, when assayed *in vivo* or *in vitro*, bone calcium resorption, and intestinal alkaline phosphatase activity. It is suggested that *o,p'*-DDT or *p,p'*-DDT interference in some of the biological responses to CC may furnish a partial explanation for the thin eggshell formation and thus reproductive failure of some raptors such as the peregrine falcons, brown pelicans, bald eagles, and sparrow hawks. (Author abstract reprinted by permission of the American Chemical Society)

72-1054. Nowicki, H. G.; Myrtle, J. F.; Norman, A. W. (Dept. of Biochemistry, U. of California, Berkeley, CA 94720). **Effects of organochlorine insecticides in metabolism of cholecalciferol (Vitamin D_3) in rachitic cockerel.** *J. Agr. Food Chem. 20(2): 380-384; 1972.* (30 references)

The major metabolic pathway in the conversion of cholecalciferol (CC) to its biologically active form involves hydroxylation to 25-OH-CC in the liver, then to 1,25-diOH-CC in the kidney. The most predominant form of the steroid in the target intestine is 1,25-diOH-CC. It is known that CC must undergo at least these two conversions prior to stimulating intestinal calcium transport. Using the blood levels of 25-OH-CC as an indication of liver function, it was found that organochlorine pesticide treatment did not influence this hydroxylation step, whereas the amount of 1,25-diOH-CC in intestine

of chicks exposed to pesticide was slightly more than in untreated chicks. 1,25-diOH-CC was shown to be homogeneous and the same in control and organochlorine insecticide-treated intestines by both sensitive silicic acid and Celite column chromatography. It is concluded from this data that cholecalciferol is converted to its biologically active forms in sufficient quantity in the presence of organochlorine insecticides to maintain normal calcium metabolism in the chick. These results do not then explain how organochlorine insecticides impair the biological responses to cholecalciferol. (Author abstract, edited, by permission of the American Chemical Society)

72-1055. Wilson, K. A.; Cook, R. M. (Dairy Science Dept., Michigan State U., East Lansing, MI 48823). **Metabolism of xenobiotics in ruminants. IV. Storage and excretion of HEOD in Holstein cows.** *J. Agr. Food Chem. 20(2): 391-394; 1972.* (11 references)

The recovery of HEOD (dieldrin) in milk, urine, blood, feces, and body fat was determined when the pesticide was orally administered in gelatin capsules to Holstein cows at the level of 0.1 mg/kg of body weight for 3 and 6 weeks. Forty to 50% of the pesticide could be accounted for as HEOD at the end of 6 weeks. Most of this was in the feces. HEOD was not detected in urine. By analyzing wet instead of dry feces, HEOD levels were four to seven times higher than when dried feces were analyzed. The main route of HEOD elimination from the body was through the feces and not through the milk. Fifty to 60% of the HEOD unaccounted for was believed to be in the form of hydroxylated metabolites. Thus, 90% of the pesticide can be accounted for in the feces and as metabolites. Phenobarbital lowered HEOD levels in milk and body fat. (Author abstract reprinted by permission of the American Chemical Society)

72-1056. Street, J. C.; Blau, S. E. (Animal Science Dept., Utah State U., Logan, UT 84321). **Oxychlordane: accumulation in rat adipose tissue on feeding chlordane isomers or technical chlordane.** *J. Agr. Food Chem. 20(2): 395-397; 1972.* (4 references)

Oxychlordane storage in adipose tissue was studied in male and female rats fed pure *cis*- and/or *trans*-chlordane or technical chlordane at levels from 50 to 200 ppm for 15 days. *trans*-Chlordane resulted in greater oxychlordane storage than *cis*-chlordane in both sexes with lower accompanying parent isomer storage. Males fed either isomer stored less oxychlordane than females. Oxychlordane storage during simultaneous administration of both chlordane isomers, or of technical chlordane itself, showed additivity of oxychlordane formation with no interaction apparent. Results of incubating chlordane isomers with rat liver homogenates indicated that oxychlordane formation proceeds *via* a dehydrogenated intermediate, dichlorochlordene. (Author abstract reprinted by permission of the American Chemical Society).

72-1057. Mehendale, H. M.; Skrentny, R. F.; Dorough, H. W. (National Inst. of Environmental Health Sciences, Research Triangle Park, NC 27709). **Oxidative metabolism of aldrin by subcellular root fractions of several plant species.** *J. Agr. Food Chem. 20(2): 398-402; 1972.* (10 references)

Three bean species and three pea varieties demonstrated an *in vitro* aldrin epoxidase activity in root extracts. Although much less efficient, aldrin epoxidase activity also was detected in root extracts of two corn varieties. The epoxidase activity was greatly enhanced by the addition of polyvinylpyrrolidone (Polyclar AT) during homogenization of the root tissue; however, the amount required for optimum results varied with each plant. In all cases, the microsomal fraction was considerably more active as a source of aldrin epoxidase than the 105,000 X *g* solubles. The addition of NADPH generally stimulated the epoxidation of aldrin. Broad bean root extracts were very effective inhibitors of aldrin epoxidation when added to active preparations from peas or Dwarf bean roots. The inhibitory activity was located in the 105,000 X *g* soluble fraction. No metabolism of heptachlor was detected in any plant preparation. (Author abstract reprinted by permission of the American Chemical Society)

72-1058. Still, G. G.; Mansager, E. R. (Plant Science Research Div., ARS, U.S. Dept. of Agriculture, Metabolism and Radiation Research Lab., State U. Station, Fargo, ND 58102). **Metabolism of 4-chloro-2-butynyl-3-chlorocarbanilate by soybean plants.** *J. Agr. Food Chem. 20(2): 402-406; 1972.* (16 references)

Root-treated soybean plants absorb, translocate, and metabolize 4-chloro-2-butynyl-3-chlorocarbanilate-^{14}C (barban-^{14}C). Water-soluble products and insoluble residues are rapidly formed in the roots. Only water-soluble residues are found in the shoots after 3 days posttreatment. Time-course experiments indicated a possible precursor product relationship between barban, soluble products, and insoluble residues. Water-soluble metabolites are not translocated once they are formed in the shoot tissues. The radiocarbon distributions in soybean plants root-treated with phenyl-^{14}C, carbonyl-^{14}C and butynyl(C-1)-^{14}C-labeled barban were identical in all comparative experiments. These studies indicate that the barban molecule was not cleaved in soybean. Barban-phenyl-^{14}C was root fed to soybean plants for 4 days and the polar metabolites were isolated. Caustic hydrolysis of polar metabolites from either root or shoot yielded 3-chloroaniline-^{14}C The recovery of 3-chloroaniline-^{14}C indicated that barban-^{14}C metabolites are formed by the alteration of the 4-chloro-2-butynyl side chain and not by hydroxylation of the aromatic nucleus, as was found for isopropyl-3-chlorocarbanilate in soybean. (Author abstract reprinted by permission of the American Chemical Society)

72-1059. Ashworth, R. J.; Sheets, T. J. (Pesticide Residue Research Lab., North Carolina State U., Raleigh, NC 27607). **Metabolism of carbofuran in tobacco.** *J. Agr. Food Chem. 20(2): 407-412; 1972.* (9 references)

Carbofuran, which had been absorbed into tobacco plants through the roots or through the petioles of isolated leaves, was metabolized, with a half-life of about 4 days, by progressive oxidation to 3-hydroxycarbofuran and 3-ketocarbofuran. All three carbamates were hydrolyzed to their corresponding phenols; the phenols and 3-hydroxycarbofuran were then conjugated as glycosides. 3-Hydroxycarbofuran and its glycoside were the major metabolites. Carbofuran applied topically was more persistent because it did not readily penetrate the cuticle of the leaves; the major portion of the applied carbofuran was, therefore, not subject to plant metabolism. (Author abstract reprinted by permission of the American Chemical Society)

72-1060. Clapp, K. L.; Nelson, D. M.; Bell, J. T.; Rousek, E. J. (Dept. of Animal Science, Texas Tech U., Lubbock, TX). **A study of the effects of toxaphene on the hepatic cells of rats.** *Proc. West. Sect. Amer. Soc. Anim. Sci. 22: 313-323; 1971.* (13 references)

Toxaphene did not significantly affect the physical appearance, gross pathology, weight gain or liver cell histology of albino rats given levels from 2.33 to 189 ppm in their diets for up to 12 weeks. There were male-female differences in liver cell diameters, as well as in weight gain and residue patterns. Dunnett's comparison test indicated that significant levels of toxaphene were present in liver, omental fat and whole body samples (minus liver and omental fat) with each dose at 4, 8 and 12 weeks. Up to 7 ppm toxaphene fed to male and female rats for 12 weeks resulted in residues equal to those permitted by the U.S.D.A.

72-1061. Grant, D. L.; Villeneuve, D. C.; Khera, K.; Clegg, D. J.; Phillips, W. E. J. (Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Canada). **Studies on the embryotoxicity and placental transfer of polychlorinated biphenyls (PCB's).** *Proc. Can. Fed. Biol. Soc. 14: 52; 1971.*

Aroclor 1254 (polychlorinated biphenyls mixture) was embryotoxic in the rabbit at dosages of 12.5, 25, or 50 mg/kg/day for the first 28 days of gestation. The polychlorinated biphenyls crossed the placenta and were recovered from the livers of the fetuses at levels higher than those in the maternal livers. No embryotoxicity was observed in the rat up to 100 mg/kg/day. (Abstract of a paper for the 14th Annual Meeting of the Canadian Federation of Biological Societies [Federation Canadienne des Societes de Biologie] at the University of Toronto, Toronto, Ontario on June 15-18, 1971.)

72-1062. Villeneuve, D. C.; Willes, R. F.; Lacroix, J. B.; Phillips, W. E. J. (Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Canada). **Placental transfer of ^{14}C-parathion in sheep.** *Proc. Can. Fed. Biol. Soc. 14: 52; 1971.*

Placental transfer of radiolabeled parathion in sheep was indicated by detection of radioactivity in maternal and fetal blood and amniotic fluid, and by thin-layer chromatographic detection of parathion. Plasma cholinesterase was reduced by 40% in the dam and 20% in the fetus following administration of 0.1 mg/kg on days 90 to 110 of gestation. (Abstract of a paper for the 14th Annual Meeting of the Canadian Federation of Biological Societies, [Federation Canadienne des Societes de Biologie] at the University of Toronto, Toronto, Ontario on June 15-18, 1971.)

72-1063. Saschenbrecker, P. W.; Platonow, N. S.; Funnell, H. S. (Canada Dept. of Agriculture, Animal Pathology Lab., U. of Guelph, Guelph, Ontario, Canada). **Metabolic study of polychlorinated biphenyls in lactating cows.** *Proc. Can. Fed. Biol. Soc. 14: 52; 1971.*

Absorption, tissue distribution and excretion of polychlorinated biphenyls (PCBs) were measured after administration of single or multiple graded doses to lactating cows. Persistence in milk and lipophilic characteristics of PCBs were noted. (Abstract of a paper for the 14th Annual Meeting of the Canadian Federation of Biological Societies [Federation Canadienne des Societes de Biologie] at the University of Toronto, Toronto, Ontario on June 15-18, 1971.)

72-1064. Hrdina, P. D.; Maneckjee, A.; Kacew, S.; Peters, D. A. V.; Singhal, R. L. (Dept. of Pharmacology, U. of Ottawa, Ottawa, Canada). **Acetylcholine and dopamine in rat striatum during acute DDT poisoning.** *Proc. Can. Fed. Biol. Soc. 14: 67; 1971.*

The acetylcholine level in the corpus striatum was reduced by about 40%, at 5 hr after administration of 600 mg/kg *p,p'*-DDT to rats. The dopamine level in the striatum remained unchanged. Analogous treatment with *o,p'*-DDT did not reduce either neurohormone. This suggests the involvement of striatal cholinergic mechanisms in the production of the hyperexcitability and tremor observed after poisoning with *p,p'*-DDT. (Abstract of a paper for the 14th Annual Meeting of the Canadian Federation of Biological Societies [Federation Canadienne des Societes de Biologie] at the University of Toronto, Toronto, Ontario on June 15-18, 1971.)

72-1065. Kacew, S.; Singhal, R. L. (Dept. of Pharmacology, U. of Ottawa, Ottawa, Canada). **Stimulation of renal gluconeogenesis by DDT.** *Proc. Can. Fed. Biol. Soc. 14: 67; 1971.*

The administration of pure and mixed DDT isomers to rats resulted in varying degrees of stimulation of the four key gluconeogenic enzymes in the renal cortex, which reached a maximum five to seven days after treatment. This stimulation was not affected by adrenalectomy or administration of triamcinolone. (Abstract of a

paper for the 14th Annual Meeting of the Canadian Federation of Biological Societies [Federation Canadienne des Societes de Biologie] at the University of Toronto, Toronto, Ontario on June 15-18, 1971.)

72-1066. Brodeur, J.; Gagne, J. (Dept. de Pharmacologie, Faculte de Medecine, Universite de Montreal, Montreal, Quebec, Canada). **Metabolic studies on the age and sex differences to parathion in rats.** *Proc. Can. Fed. Biol. Soc. 14: 80; 1971.*

Tissue levels and degradation of parathion were measured following administration of equitoxic doses to male and female adult rats and weanlings. The findings indicated that parathion degradation is delayed in weanlings and adult females, and paraoxon degradation in weanlings; and that the adult male rat brain is least sensitive to paraoxon. High parathion levels in fatty tissues and degradation of parathion in the kidney were also noted. (Abstract of a paper for the 14th Annual Meeting of the Canadian Federation of Biological Societies [Federation Canadienne des Societes de Biologie] at the University of Toronto, Toronto, Ontario on June 15-18, 1971.)

72-1067. Niemi, W. D.; Webb, G. D. (U. of Vermont, Burlington, VT 05401). **The effects of DDT on membrane-bound ATPase in the monocellular electroplax preparation.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 395; 1972.*

The innervated (posterior) membrane of the electroplax of *Electrophorus electricus* (the electric eel) produces action potentials but the noninnervated (anterior) face does not. We wished to find out which face of the electroplax contained most of the Na-K activated ATPase activity and whether or not DDT inhibited this activity. Membrane-bound ATPase activity was measured by exposing electroplax cells or parts of cells to solutions containing 2m*M* ATP and measuring the rate of inorganic phosphate production by a modification of the Fiske-Subbarrow method using a Technicon Autoanalyzer. The predominant ATPase was found to be a K requiring, ouabain sensitive ATPase. In experiments where the cells were dissected into separate anterior and posterior parts, it was found that the anterior part of the cell hydrolyzed ATP at more than twice the rate of the posterior half. In experiments with intact cells, ATPase activity correlated well with the number of cells but not with the protein content of the cells. $10^{-7}M$ DDT produced a slight inhibition of the ATPase activity of electroplax cells and $10^{-4}M$ DDT caused more than a 60% inhibition of the ATPase activity. DDT inhibition is additive with ouabain inhibition. It was concluded that most of the ATPase activity of the electroplax is localized in the noninnervated membrane. This ATPase activity is inhibited by DDT. (Abstract number 996, 56th Annual FASEB Meeting, Atlantic City, N. J.,April 9-14, 1972, reprinted by permission.)

72-1068. Filbert, M. G.; Lochner, M. A.; Yamamura, H. I.; Harris, L. W.; Fleisher, J. H. (Biomedical Lab., Edgewood Arsenal, MD 21010). **Return of acetylcholinesterase (AChE) in subcellular fractions of brain after inhibition by pinacolyl methylphosphonofluoridate (soman).** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 515; 1972.*

AChE activity in subcellular fractions of brain homogenates from atropinized rats given 55 μg/kg (1.1 LD50) of soman i.v. approximated 17% of unpoisoned controls at 1/2 hour after soman. The return of enzyme activity as measured by the ratio in brain tissue of rats surviving 24 hours to that at 1/2 hour was: soluble fraction (SF)-2.3; microsomes (M)-1.96; whole homogenate (WH)-1.98; nerve ending particles (NEP)-1.45. NEP were exceptional in that 95% confidence limits for AChE at 1/2 hour and 24 hours overlap. The faster recovery rate of AChE in SF and M than in NEP may be interpreted as being due to synthesis in cell bodies followed by transport to the nerve endings. Similar findings were obtained in subcellular fractions of guinea pig brain stem after a comparable dose of soman. Since dephosphorylation has been excluded, the regeneration of AChE is taken as resulting from synthesis involved in protein turnover. The half-time for AChE turnover in WH, M and SF of guinea pig brain tissue approximated 4 to 5 days in contrast to 8 days for NEP based upon recovery from soman inhibition. (Abstract number 1700, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1069. Swartz, R. D.; Sidell, F. R. (Biomedical Lab., Edgewood Arsenal, MD 21010). **The effect of changes in renal blood flow on the renal excretion of pralidoxime chloride (2-PAMCl).** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 518; 1972.*

An iv dose of the cholinesterase reactivator 2-PAMCl (pyridine-2-aldoxime methochloride) is rapidly cleared from the blood, approximately 80% appearing in the urine within 3 hours. To assess the effects of altered renal blood flow on the excretion of 2-PAMCl, 6 subjects were given 5 mg/kg 2-PAMCl iv under the following conditions: R, rest at 70°F; H, rest at 105°F dry-bulb/75°F wet-bulb; E, 3 mph walk at 70°F; and HE, 3 mph walk at 105°/75°. Clearances of creatinine (C/cr), *p*-aminohippurate (C/PAH), and 2-PAMCl (C/2-PAMCl) were determined simultaneously. C/cr and C/PAH were within normal limits in R. C/cr decreased significantly only in HE compared to R. C/2-PAMCl decreased by amounts strikingly similar to decreases in C/PAH, both in E compared to R and in HE compared to H. Thus the renal excretion of 2-PAMCl is significantly affected by the stress of exercise which alters C/PAH. (Volunteers in these tests are enlisted US Army personnel. The tests are governed by the principles, policies, and rules for medical volunteers as established in AR 70-25). (Abstract number 1718, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1070. Merkens, L. S.; Janicki, R. H.; Kinter, W. B. (Mt. Desert Island Biology Lab., Salisbury Cove, ME 04672). **Disruption of osmoregulation in marine adapted eels (*Anguilla rostrata*) and killifish (*Fundulus heteroclitus*) by DDT and a polychlorinated biphenyl (PCB) mixture.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 520; 1972.*

Ability to osmoregulate was followed in eels (100 g) placed in 15°C sea water (2 liters) with 0.1% ethanol and 1 ppm DDT [1,1,1-trichloro-2,2-bis (*p*-chlorophenyl) ethane] which is lethal by 10 hr. At 6 hr plasma milliosmolality averaged 462 ± 10 SE (5 fish) compared to 358 ± 10(5) for ethanol controls. Much of this rise was due to Na; ppm ^{14}C-DDT in gut and gill averaged 7 ± 1(6) and 22 ± 2(6). In isolated gills incubated 1 hr in 15°C oxygenated sea water, ^{22}Na space was increased 45% ($P<0.01$) by 50 ppm DDT solubilized with 0.5% *N,N*-dimethyl-formamide (DMF). Using gill homogenate and our assay procedure (*Science 173: 1146, 1971*), Na,K-ATPase was inhibited 38% ($P<0.01$) by 50 ppm DDT solubilized with 5% DMF. These and our previous intestinal data support the view that DDT inhibits Na transport in the primary osmoregulatory organs of marine teleosts. Finally, experiments with killifish (10 @ 5 g) in 15°C sea water with 0.1% ethanol (2 liters) demonstrated roughly equivalent lethality (24 hr) for 0.25 ppm DDT and 75 ppm Aroclor 1221; 6-hr exposure to these levels increased plasma milliosmolality from 365 ± 3 (6 samples, each from 3-5 ethanol control fish) to 389 ± 9(8) and 396 ± 7(9), respectively, suggesting similar mechanisms of toxicity for these types of environmental contaminants. (Abstract number 1726, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1071. Kacew, S.; Singhal, R. L. (Pharmacology Dept., Ottawa U., Ottawa, Canada). **Role of adrenals in acute effects of *p,p'*-DDT on renal glucose metabolism.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 520; 1972.*

The activities of pyruvate carboxylase, phosphoenolpyruvate carboxykinase, fructose 1,6-diphosphatase and glucose 6-phosphatase in renal cortex were enhanced over control values in rats treated p.o. with DDT. Following a single dose of *p,p'*-DDT (60 mg/100 g), significant increases in the four key gluconeogenic enzymes could be detected as early as 1 hr, whereas maximal stimulation (2-3 fold) was noted after 4-5 hr. The observed enhancement of kidney enzymes was related to the dose of the insecticide and 10 mg/100 g of *p,p'*-DDT was the minimum amount necessary to produce a statistically significant response. Actinomycin D, cycloheximide or ethionine failed to affect the basal levels of either of these enzymes but significantly reduced the DDT-induced increases in various enzyme activities. The rise in gluconeogenic enzymes induced by DDT was not affected by adrenalectomy and administration of triamcinolone to DDT-treated adrenalectomized rats did not potentiate the action of the pesticide of renal gluconeogenesis. Both *p,p'*-DDT and *o,p'*-DDT seemed equally effective in elevating the levels of the four enzymes in renal cortices of male and female rats indicating that no sex difference existed for the action of the two DDT isomers. Our results demonstrate that the DDT-induced stimulation of various key enzymes of the gluconeogenic pathway is independent of adrenal function. (Abstract number 1727, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1072. Cress, C. R.; Strother, A. (School of Medicine, Loma Linda U., Loma Linda, CA 92354). **Effects on drug metabolism of carbaryl and α-naphthol.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 520; 1972.*

Due to their rapid breakdown in the environment, the carbamate insecticides are generally accepted by environmentalists. There is a dearth of information, however, regarding the effects of the breakdown products of these agents on mammalian organisms. This study investigated the effects on young male Swiss-Webster mice of a 2-week feeding of control feed vs. (I) carbaryl, 25 μmole/kg of feed, stored at 0°C; (II) carbaryl, 25 μmole/kg of feed, stored at room temperature to permit environmental breakdown; and (III) α-naphthol, 25 μmole of feed. Lethality of an acute oral dose of carbaryl was significantly ($P<.05$) decreased by I and II but not by III. Liver weight was significantly depressed by I and II but was increased by III. Body weight was also depressed significantly by I and II but not by III. The rate of *in vitro* metabolism of aniline was increased by all three treatments, but that of benzphetamine was increased by I and II only. Hepatic microsomal contents of cytochrome P-450 were increased slightly by all three treatments, but the effect was statistically significant only in the case of I. It was concluded that carbaryl induces hepatic microsomal enzyme systems even after at least partial environmental breakdown, and that α-naphthol plays a minor role in the effects elicited by carbaryl after breakdown. (Abstract number 1728, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1073. Rider, J. A.; Swader, J. I.; Puletti, E. J. (Franklin Hosp. Foundation, San Francisco, CA 94114). **Anticholinesterase toxicity studies with Guthion, Phosdrin, Di-syston, and Trithion in human subjects.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 520; 1972.*

This is a continuing study of the effects of various organic phosphate insecticides on plasma and RBC cholinesterase in humans. Each dose level of a compound was studied with 5 test subjects and 2 controls. Plasma and RBC cholinesterase levels were measured twice weekly during a control period followed by a 30-day test period during which the test dose was administered daily. The following dose levels were studied:

Guthion (azinphosmethyl) – 18 and 20 mg/day (in progress); Phosdrin (mevinphos) – 2.0 and 2.5 mg/day (in progress); Di-syston (disulfoton) – 0.75 mg/day; and Trithion (carbophenothion) – 0.8 mg/day. Results: Guthion studies did not demonstrate any significant anticholinesterase effects. Phosdrin has produced borderline depression (20%) in RBC cholinesterase with dose levels of 1.5 and 2.0 mg/day. In the current study phosdrin, 2.5 mg/day, has been administered for 23 days and a 24% decrease in RBC cholinesterase has been produced. This level meets the criterion of a 20-25% cholinesterase depression to be designated the level of minimal incipient toxicity. Plasma cholinesterase has shown only slight decreases with phosdrin. No significant anticholinesterase effects were seen with the initial dose levels of di-syston and trithion. (Abstract number 1730, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1074. Reiter, L.; Talens, G.; Woolley, D. (Depts. of Environmental Toxicology and Animal Physiology, U. of California, Davis, CA 95616). **The effects of parathion on one-trial learning in mice.** *Fed. Proc.; Fed. Amer. Soc. Exp. Biol. 31(2): 552; 1972.*

The effects of parathion on learning and memory of a one-trial passive avoidance task were tested in mice. An asymptomatic dose of parathion (6 mg/kg p.o. in polyethylene glycol) was given to mice at various time intervals (0.5 to 4.0 hr) prior to either learning trials or retesting 24 hr later. In another group of animals, blood and brain levels of acetylcholinesterase (AChE) were determined following drug administration. The results indicate that parathion given before learning trials is effective in blocking learning. Parathion produced maximal disruption of performance when it was administered one hour prior to the learning trials; only 29% of animals in this group learned. At this time blood and brain AChE activity had fallen to about 48% and 40% of controls, respectively. Administration of parathion prior to retesting also resulted in some disruption of performance although this effect on memory was not as great as the effect on learning. These results indicate that parathion interferes not only with learning but also with memory of a passive avoidance task. Furthermore, the peak behavioral effect coincides with peak inhibition of brain AChE activity. (Abstract number 1908, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1075. Guarino, A. M.; Call, J. B.; Rall, D. P. (LCP, National Cancer Inst., Bethesda, MD 20041). **Studies of the persistence of DDT and methyl mercury in the lobster after various modes of administration.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 561; 1972.*

The organ distribution of total ^{14}C-DDT or ^{14}C-methyl Hg (MH) was studied in lobsters (*Homarus americanus*) which had received one of these environmental pollutants by administration either by intravascular or oral routes, or after uptake from ambient sea water. The hepatopancreas contained most of the radioactivity after intravascular injection of DDT, and the half-life for removal from this organ was 46 days. Regardless of the mode of receiving DDT, more than 95% of the absorbed dose remained in the hepatopancreas after 7 days. After intravascular injection the early distribution of ^{14}C-MH was similar to that of DDT, i.e., high levels occurred in heart, hepatopancreas and gonads at 24 hrs. Large amounts of radioactivity were also present in intestine, brain and gill. Hepatopancreas levels decayed with a half-life of about 14 days while an interesting redistribution of MH occurred where the 33 day levels of tail muscle became about 2-fold higher than those of the 1 day values. Six days after MH was administered with food, 68% of the absorbed dose was present in the hepatopancreas and 5% was in the tail muscle. When MH was added to ambient water these values were 23% for hepatopancreas and 60% for tail muscle. Thus, such comparisons of DDT and MH distribution after 3 modes of entry revealed major differences in handling these compounds by the lobster. (Abstract number 1955, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1076. Martz, F.; Straw, J. A. (Dept. of Pharmacology, George Washington U. School of Medicine, Washington, DC 20005). **Effects of mitotane (*o,p'*-DDD) on hepatic drug metabolism in dogs.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 581; 1972.*

The adrenocorticolytic drug mitotane (TDE) prolongs pentobarbital sleeping time in dogs when given acutely or chronically. The chronic effect appears to be secondary to adrenal suppression because it is reversible with cortisol while the acute effect is not. Pentobarbital (PB), aniline (AN) and ethylmorphine (EM) metabolism were studied in microsomes prepared from the livers of control dogs and dogs treated chronically with mitotane 200 mg/kg, p.o., daily for 3 days. The effects on EM demethylase, cytochrome C reductase, P450 and microsomal protein content are indicative of enzyme induction. The decrease in PB and AN hydroxylations is consistent with the effect on PB sleeping time but cannot be related to changes in cytochrome C reductase, P450 and protein content. The kinetics of PB hydroxylase with *in vitro* mitotane with control microsomes suggest that the acute effect on PB sleeping time is due to the competitive inhibition of PB hydroxylase. (Abstract number 2068, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission, abridged.)

72-1077. Wilson, W. E.; Sharp, C. W. (N.I.E.H.S., National Institutes of Health, Research Triangle Park, NC 27709). **Chlorinated biphenyl interaction with beef brain (Na^++K^+)ATPase.** *Fed. Proc., Fed. Amer. Soc. Exp.*

Biol. 31(2): 591; 1972.

Inhibition of beef brain (Na^++K^+)ATPase by [poly]chlorinated biphenyls (CBs) has been compared with results obtained previously with several classes of the chlorinated hydrocarbon pesticides. The (Na^++K^+) ATPase (40 μg protein/ml) is inhibited 50% upon exposure to 8 to 14 ppm of Aroclor 1221 (a commercial mixture, primarily, of mono- and dichlorinated biphenyls), Aroclor 1254 (a mixture of biphenyls substituted with 3 or more chlorines) or DDT. Several subfractions of Aroclor 1221 obtained by distillation, 2-chlorobiphenyl and 3-chlorobiphenyl were about as inhibitory as Aroclor 1221, whereas, biphenyl, 4-chlorobiphenyl and 4,4′-dichlorobiphenyl were less inhibitory. Upon addition to the aqueous incubation medium, the ethanolic solution of each CB or CB mixture underwent a change of state or of phase over a period of seconds to hours. Each of the CBs was inhibitory upon addition of ethanolic solutions of these compounds to the incubation medium; however, only Aroclor 1254 yielded significant inhibition when exposure to the (Na^++K^+)ATPase was as a previously prepared dispersion of the oil in water. As in the case of DDT inhibition, phosphatidyl serine protected beef brain (Na^++K^+)ATPase from inhibition by CBs. Thus, beef brain (Na^++K^+)ATPase inhibition by CBs simulates several aspects of enzyme responsiveness to chlorinated hydrocarbon pesticides. (Abstract number 2119, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1078. Schneider, R. P. (Food and Biol. Sci. Div., Batelle-Columbus Laboratories, Columbus, OH 43201). **Kinetics in inhibition of (Na+K)-ATPase by DDT and allethrin.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 591; 1972.*

The (Na+K)-ATPases in swine erythrocyte membrane fragments and rat brain microsomes are inhibited by DDT and allethrin. The kinetics of inhibition by these compounds are similar in both preparations. Both of these compounds interact competitively with Na^+ in the case of the enzyme from erythrocytes. The concentration of DDT to cause one-half of maximal inhibition is about 4 μmoles/l for the brain enzyme and 30 μmoles/l for the erythrocyte preparation. The enzyme from brain shows mixed inhibition kinetics with respect to Na^+ in the presence of K^+ concentrations less than 40 m*M*. At higher concentrations of K^+ the kinetics are competitive with Na^+. When K^+ is varied but held below 1 m*M*, inhibition is noncompetitive with K^+. Inhibition is increased several fold, however, by increasing K^+ concentrations from 10 to 100 m*M*. The apparent competitive interaction of these compounds with Na^+ tends to support earlier suggestions that DDT specifically blocks Na^+ sites or receptors in cell membranes. The effects of DDT and allethrin together are not additive, suggesting a common site of inhibition. The structure of allethrin does not resemble that of DDT, but they have similar effects on electrical activity of nerves. The apparent blocking of Na^+ activation and the common mode of inhibition of the (Na+K)-ATPase by DDT and allethrin suggests that inhibition of this enzyme may be analogous to effects on nerve function. (Abstract number 2120, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1079. Pritchard, J. B. (Mt. Desert Island Biology Lab., Salisbury Cove, ME 04672). **Metabolism of DDT and its relation to persistence in the winter flounder.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 605; 1972.*

Winter flounder, *Pseudopleuronectes americanus*, were injected via the caudal vein with 100 μg/kg ring-labeled ^{14}C-DDT (1,1,1-trichloro-2,2-bis-(*p*-chlorophenyl)-ethane). Fish were sacrificed at intervals from 15 min to 1 wk after injection. Tissue and fluid samples were extracted and extracts were analysed by thin-layer chromatography. At all times plasma, bile, and all tissues contained predominantly DDT. From 90 to 97% (average 93.2%) of the label represented DDT. DDD (TDE, 1,1-dichloro-2,2-bis-(*p*-chlorophenyl)-ethane) (2.6%), DDE (1,1-dichloro-2,2-bis-(*p*-chlorophenyl)-ethylene (1.3%), and one or more relatively polar metabolites (2.9%) accounted for the remaining radioactivity. In contrast, the more polar compounds accounted for from 40 to 80% (average 55%) of the radioactivity found in urine. DDT made up only, on the average, 22% of the label, while DDD and DDE accounted for the remainder (9 and 14% respectively). Flounder kidney, therefore, much more efficiently eliminated these more polar, more water-soluble metabolites than the parent DDT. Nevertheless, since metabolism to such compounds is so slight, renal excretion accounted for only 2% of the injected pesticide by one week. Thus persistence in this species arises not only from the high lipid solubility, and resulting high tissue affinity, of the parent compound, but also from the lack of metabolism to more water soluble, more easily excreted derivatives. (Abstract number 2203, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1080. Lech, J. J. (Medical Coll. of Wisconsin, Milwaukee, WI 53233). **Isolation and identification of TFM glucuronide in bile of TFM exposed rainbow trout.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 606; 1972.*

TFM (3-trifluoromethyl-4-nitrophenol) is a selective sea lamprey larvicide which is currently being used to control the population of the parasitic sea lamprey, *Petromyzon marinus*, in the Upper Great Lakes. Rainbow trout were exposed to ^{14}C-TFM at sublethal concentrations (0.5-1.0 mg/l) for 24 hours after which the bile was collected and analyzed for possible metabolites. The major metabolite found in bile was a polar compound having an Rf of 0.35 in butanol-acetic acid-water (35:3:10) on silica gel TLC plates. This compound was purified by column chromatography on Amberlite

XAD-2, Sephadex G-15 and Sephadex QAE-A-25 and by preparative thin-layer chromatography. The metabolite thus obtained showed only one spot with sulfuric acid charring in two TLC solvent systems. The metabolite had a UV maximum of 278 nm in both 0.1*N* HCl and 0.1*N* NaOH. The material was hydrolyzable with bacterial β-glucuronidase after which the spectral peaks occurred at 395 nm in 0.1*N* NaOH and at 298 nm in 0.1*N* HCl. These maxima were identical with those of authentic TFM. The material released with β-glucuronidase treatment co-chromatographed with TFM on silica gel in benzene-diethyl ether-glacial acetic acid (50:25:0.5) and had the same retention time as authentic TFM in VPC analysis on QF-1 column. The hydrolysis of the metabolite by β-glucuronidase was inhibited by $55 \times 10^{-3} M$ saccharo-1,4-lactone, a specific inhibitor of β-glucuronidase. (Abstract number 2204, 56th Annual FASEB Meeting, Atlantic City, N.J., April 9-14, 1972, reprinted by permission.)

72-1081. Myrh, B.C. (Batelle, Columbus Laboratories, Columbus, OH 43201). **Pesticide effects of amino acid and uridine incorporation in mammalian cell culture.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 608; 1972.*

Various pesticides have been introduced into spinner cultures of HeLa cells to study the response of mammalian cells independently of the well-known nervous system disorders induced by many of these compounds. Measurements of ^{14}C-labeled amino acid and ^{3}H-uridine incorporation into trichloroacetic acid precipitates in a 30 min exposure period were utilized as a screen for compounds affecting protein and/or RNA synthesis. Suspensions or solutions of DDT, aldrin, carbaryl, and parathion, as examples, at 400 μg/ml all inhibited amino acid incorporation by 68% or greater, while only carbaryl inhibited uridine incorporation (90%). Dose-response curves for amino acid incorporation yielded ID50 values similar to those from growth measurements over 48 hr for these compounds. Various fumigants and chlorophenol fungicides strongly inhibited both activities; simazine, dimethoate, and trichlorfon affected neither. None of the 30 various pesticides examined, however, selectively inhibited uridine incorporation, suggesting that membrane functions including precursor transport into the cell, are often the inhibited events. This general conclusion is supported by observations of increased inhibition at lower precursor concentrations and the fact that suspended particulates of DDT are responsible for its inhibitory action. (Abstract number 2220, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1082. Zabik, M. E., Schemmel, R.; Leveille, G. A. (Dept. of Food Science and Human Nutrition, Michigan State U., East Lansing, MI 48823). **Tissue content of dieldrin in obese and reduced Osborne Mendel male rats.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 725; 1972.*

In order to test the effect of weight reduction on tissue loss of dieldrin (HEOD), 18 Osborne Mendel (OM) male rats were made obese by feeding a high fat diet (60% Crisco, w/w) and then at weights of around 1150 g (45 wks of age) the group was fed 0.8 mg HEOD/rat/day. During this time all feces were collected for subsequent HEOD analysis. The rats were then divided into 3 groups of approximately equal body weights as follows: 1) sacrificed immediately, 2) reduced for 6 weeks by restricting daily intake of high fat diet to 1/2 normal intake and 3) weight maintenance for 6 weeks (or slight gains in body weight) by feeding the high fat diet *ad libitum*. The latter two groups were fed no additional dieldrin. Tissues analyzed for dieldrin were the inguinal and testicular and the combined perirenal and retroperitoneal fat depots, liver, kidney, heart, brain and blood. In general, absolute quantities of HEOD in tissues were greater for Group 1 regardless of diet than for groups 2 and 3 and similar for groups 2 and 3. However, relative quantities of HEOD in the fat depots analyzed were increased in the reduced animals. This study suggests that weight reduction does not decrease tissue contents of HEOD. (Abstract number 2867, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1083. Wakeling, A. E.; Schmidt, T. J.; Visek, W. J. (Cornell U., Ithaca, NY 14850). **Evidence for influence of dieldrin on binding of 5α-dihydrotestosterone in the rat ventral prostate.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 725; 1972.*

5α-Dihydrotestosterone (17β-hydroxy-5α-androstan-3-one) binds to specific receptor proteins in the cytoplasm and nucleus of the rat ventral prostate. Minced prostate tissue from 24 hr castrate rats was incubated at 37°C for 30 min in 0.32*M* sucrose - 1 m*M* magnesium chloride containing 4.5×10^{-11} *M* 1,2-^{3}H-5α-dihydrotestosterone (44 C/mMole) with 10 ppm dieldrin or 4.0×10^{-6} *M* cyproterone acetate, an antiandrogen, as treatments. Cytosol and 0.6 *M* NaCl extracts of purified nuclei were passed through a G-25 sephadex column, and the specific activity of the binding fraction eluted at the exclusion volume was measured. The mean specific activities (dpm/mg protein) of the nuclear binding fractions from control (41,890 ± 9,270) and 10 ppm dieldrin (27,854 ± 7,903) incubations were significantly different ($P<0.001$). The corresponding values for cytoplasm 48,219 ± 11,451 (control) and 30,695 ± 8,087 (10 ppm dieldrin) were significantly different ($P<0.005$). Dieldrin (10 ppm) inhibited binding by 33 ± 11% in the nucleus and by 36 ± 4% in the cytoplasm. Cyproterone acetate ($4.0 \times 10^{-6} M$) inhibited binding by 67 ± 8% in the nucleus and by 57 ± 14% in the cytoplasm. Corresponding specific activities were 37,413 ± 7,832 and 12,376 ± 4,053 ($P<0.01$) for control and cyproterone acetate respectively in the nucleus and 42,658 ± 6,923 and 18,144 ± 5,993 ($P<0.01$) in the

cytoplasm. (Abstract number 2868, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1084. Serine, E. A.; Schraer, R. (Dept. of Biochemistry, Pennsylvania State U., University Park, PA 16802). **Effect of DDT on avian carbonic anhydrase.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 726; 1972.*

The effect of *o,p*-DDT and *p,p'*-DDT on purified chicken carbonic anhydrase (CCA) isolated from *Gallus domesticus* was observed in the catalysis of the hydration of carbon dioxide as assayed by a modified Wilbur-Anderson technique and of the hydrolysis of the ester, *p*-nitrophenylacetate, as assayed spectrophotometrically at 348 nm. Assays were performed in 0.0167*M* phosphate or 0.020*M* veronal buffers which contained 1% or 34% dimethylformamide (DMF) in order to increase the solubility of DDT. Prior to all assays CCA was protected with 1m*M* dithiothreitol. The hydrase activity of CCA ($2.5 \times 10^{-8} M$) was depressed more than 85% in solutions containing either *o,p*-DDT or *p,p'*-DDT ($2 \times 10^{-4} M$) in the presence of 1% or 34% DMF. However, neither form of DDT caused any measureable effect on the esterase activity of CCA. Bovine carbonic anhydrase (BCA) was observed for comparison. With BCA the coprecipitation effect was confirmed in 1% DMF; also, no inhibition of hydrase activity was observed in 34% DMF, nor did either form of DDT effect esterase activity. Data demonstrate that under the conditions of the experiment *o,p*-DDT and *p,p'*-DDT depress the catalysis of the hydration of carbon dioxide by carbonic anhydrase from an avian source in contrast to observations on the bovine enzyme. (Abstract number 2869, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1085. Couch, J. R.; Coon, C. N.; Creger, C. R. (Texas A&M U., College Station, TX 77843). **DDT metabolism of laying hens.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 726; 1972.*

Nine hens each, 7, 12, and 20 months of age were placed in individual laying cages and fed a practical diet supplemented with 700 ppm DDT for a period of 22 weeks, after which time the DDT was removed and the experiment continued for 4 weeks. Egg production during the 22 week period decreased to less than 20% and had increased to 49% 4 weeks after the DDT was removed. One hundred eggs were collected from each group at 13-15 weeks on test and incubated with a hatchability of fertile eggs of 97%. The 13-15 weeks on test eggs were found to contain 1105 ppm total DDT metabolites (275 ppm DDE and 830 ppm DDT). Day old chicks from these eggs were found to contain 148 ppm total DDT metabolites (80 ppm DDE and 68 ppm DDT). Adipose tissue from hens sacrificed at 13 weeks contained 1114 ppm total DDT metabolites (413 ppm DDE, 129 ppm DDD and 572 ppm DDT). Livers were found to contain 73 ppm DDT metabolites (35 ppm DDE, 34 ppm DDD and 4 ppm DDT). Results from this study indicate that DDT has no effect on hatchability. The total DDT metabolites in the egg and adipose tissue were identical. The DDT is stored in the adipose tissue and converted to metabolites in the liver. (Abstract number 2870, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1086. Hall, S. M. (UCLA School of Public Health, Los Angeles, CA 90024). **Effects on pregnant rats and their progeny of adequate or low protein diets containing 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) or *p,p'*-DDT.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 726; 1972.*

Pregnant female rats were fed 20% casein and 6% casein diets. Each of these diets was supplemented throughout the gestation period with either DDT at 100 ppm and 500 ppm or 2,4,5-T at 250 ppm and 1,000 ppm. Of those mothers receiving 20% casein diets, only the group fed high levels of 2,4,5-T showed a decrease in food intake, weight gain, and feed efficiency ratio. In all groups receiving 6% casein diets, these parameters were reduced. On day 22 of gestation, the progeny were delivered by caesarean section. The percentage of resorptions, number of still births, and the number of pups per litter were similar in all groups. With 20% casein diets, placenta weights and body, brain, liver, and kidney weights of the progeny were reduced only when mothers were fed high levels of 2,4,5-T. All progeny from mothers with 6% casein diets had decreased body and tissue weights, with a greater reduction associated with higher levels of DDT and 2,4,5-T in the mother's diet. DNA and protein content of the placenta, brain, liver, and kidneys of these progeny parallel the reduction in tissue weights. The level of dietary protein influences the adverse effects of both 2,4,5-T and DDT in mothers and progeny. Growth and food intake of the mother during pregnancy are reflected in the development of the progeny. (Abstract number 2871, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1087. Miranda, C. L.; Webb, R. E. (Dept. of Biochemistry and Nutrition, Virginia Polytechnic Inst. and State U., Blacksburg, VA 24061). **Effect of quality of dietary protein on heptachlor toxicity.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 726; 1972.*

Weanling male albino rats were pair-fed diets containing 10% protein from casein or gluten with or without supplemental aa. After 10 days of feeding, the animals were injected ip with graded doses of heptachlor and deaths were subsequently recorded. The same protocol was followed using gluten and casein diets containing 18% protein. At 10% dietary protein, the calculated LD50 values of heptachlor in groups pair-fed unsupplemented gluten, supplemented gluten, and casein were

68.2, 40.6 and 41.0 mg/kg, respectively. Using a dietary protein level of 18%, the LD50 value of heptachlor in gluten-fed rats was 57.2 mg/kg as compared to 26.6 mg/kg for the casein-fed animals. The results indicate that a better quality protein (casein or supplemented gluten) renders rats more susceptible to the acute toxicity of heptachlor than does a poorer quality protein (unsupplemented gluten). The observed differential toxicity of heptachlor may be related to the alteration of hepatic cytochrome P-450 which is essential for heptachlor epoxidation. Additional studies conducted showed that the cytochrome P-450 levels were lower in rats fed unsupplemented gluten diet than in those fed supplemented gluten or casein diets. The induction of cytochrome P-450 in rat liver by heptachlor was also impaired by feeding the unsupplemented gluten diet. (Abstract number 2872, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1088. Wells, M. R.; Yarbrough, J. D.; Glick, B. (Mississippi State U., State College, MS 39762). **The *in vivo* and *in vitro* retention of organochlorine compounds by tissues of insecticide resistant and susceptible mosquitofish.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 813; 1972.*

Insecticide-resistant mosquitofish collected from the Mississippi Delta and susceptible mosquitofish from State College, Mississippi, were assayed for endrin-^{14}C, aldrin-^{14}C, dieldrin-^{14}C, and DDT-^{14}C retention in particulate fractions of livers and brains following *in vivo* and *in vitro* treatment. Particulate fractions were prepared by differential centrifugation and were identified by electron microscopy. The *in vivo* studies indicate a significant difference between susceptible and resistant fish brains in the uptake of all organochlorine compounds tested. They also indicate a more effective blood-brain barrier in resistant fish. There was a difference in total distribution of insecticide within brain fractions, specifically within the cell membrane and mitochondria. It appears that the cell membranes of resistant fish retain the insecticide, thus reducing the amount entering the cell. The opposite effect is seen in the mitochondrial membrane as the insecticide was prevented from entering the cell. Relatively pure myelin fractions showed less retention of insecticide in all resistant myelin fractions thus suggesting a structural difference in myelin in resistant fish. (Abstract number 3375, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission, edited.)

72-1089. Enns, T. (Scripps Inst. of Oceanography, U. of California, San Diego, La Jolla, CA 92037). **Carbonic anhydrase activity in human and bovine red cells as effected by DDT.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 819; 1972.*

It has been found that bovine carbonic anhydrase looses [*sic*] its catalytic effect on the rate of hydration of carbon dioxide when added to suspensions of dispersed DDT (2,2-bis-(*p*-chlorophenyl)-1,1,1-trichloroethane). An inhibitory effect is also obtained when the DDT, in dissolved form, is added to carbonic anhydrase, the data being similar to those obtained by adding acetazolamide. The minimum amount required to deactivate one mole of enzyme is one to two moles of DDT. Earlier experiments with human red cells indicated that DDT concentrated in the cell membranes and abolished the external carbonic anhydrase catalytic effect while leaving high internal activity. Combined with the more direct evidence of carbonic anhydrase inhibition by DDT, this suggests that relatively small amounts of DDT may selectively inhibit the enzyme at the cell membrane. (Abstract number 3408, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1090. Pearson, T. R.; Talens, G. M.; Woolley, D. E. (Depts. of Animal Physiology and Environmental Toxicology, U. of California, Davis, CA 95616). **Effects of DDT-treatment on visual-evoked potentials in immature monkeys (*Macaca radiata*).** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 821; 1972.*

Effects of DDT treatment on development on the CNS of newborn monkeys were investigated by using the characteristics of flash-evoked potentials to evaluate possible neurotoxic damage. Monkeys were given 25 mg/kg DDT orally daily during pregnancy and after parturition. Blood levels of DDT in the control group averaged 0.01 μg/g fresh tissue and 2.0 μg/g in the treated group. After birth milk levels of DDT were less than 1.0 μg/g in the control and 15-20 μg/g in the treated group. Flash-evoked potentials were recorded with Beckman skin electrodes placed on the scalp over the visual cortex of newborn monkeys. The waveform of both groups at 2-3 days is biphasic (positive-negative). In untreated animals at two weeks an initial negativity preceding the positive-negative wave sequence develops. The peak latency of the positive wave in newborn untreated monkeys at 1/sec flash rate is about 80 msec and does not differ from DDT-treated animals. In both groups the latency of all components of the waveform increases similarly with increasing flash frequency. The maximum response at 2-3 days in both groups is at 1-2/sec flash rate. Although older treated animals have not yet been recorded, these results suggest that the visual-evoked potential in 2-3 day old monkeys is not affected by prenatal administration of DDT in levels much higher than those normally found in man. (Abstract number 3422, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1091. Shiplov, J. J.; Graber, C. D.; Keil, J.; Dougherty, W. J. (Medical U. of South Carolina, Charleston, SC 29401). **Effect of DDT on the anamnestic response in**

man and rabbits. *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 936; 1972.*

S. typhi vaccine was given to oral DDT-dosed human volunteers and rabbits previously immunized with this antigen. Confirmative chemistries showed DDT levels in plasma and other body fluids of test subjects to considerably exceed expected inadvertent serum concentrations for the period of the study. Anamnestic titers irrespective of route of antigen administration were always higher in rabbits than man. No significant difference in anamnestic titers in either DDT-dosed humans or rabbits from controls were found using *S. typhi* O and H agglutinins and Vi hemagglutinins. Immunoglobulin levels for IgG, IgM and IgA were no different for DDT-treated humans than controls. Electron microscopy of liver sections from DDT-imbibing rabbits showed increases in lysosomes and endoplasmic reticulum. A fatal anaphylactic episode occurred in one rabbit following the 10th and final dose of DDT. (Abstract number 4109, 56th Annual FASEB Meeting, Atlantic City, N. J., April 9-14, 1972, reprinted by permission.)

72-1092. Cehovic, G.; Dettbarn, W. D.; Welsch, F. (Dept. of Pharmacology, School of Medicine, Vanderbilt U., Nashville, TN 37203). **Paraoxon: effects on rat brain cholinesterase and on growth hormone and prolactin of pituitary.** *Science 175(4027): 1256-1258; 1972.* (20 references)

Cholinesterase activity of brain and content of growth hormone and prolactin in the pituitary were compared after short-term (3 days) and long-term (14 days) treatment with paraoxon in male and female rats. Within 3 days cholinesterase activity was reduced to between 5 and 15 percent of that in controls. The content of growth hormone in the pituitary was increased in long-term experiments by 50%. This increase in paraoxon-treated animals suggests a possible role of a cholinergic mechanism in the regulation of growth hormone secretion. (Author abstract reprinted by permission of the American Association for the Advancement of Science)

See also **72-0888** **72-0960** **72-0964** **72-1102** **72-1112**

72-1093. Sirchia, G.; Ferrone, S.; Zanella, A. (Istituto di Patologia Speciale Medica e Metodologia - Clinica dell' Universita di Milano, Milan, Italy). **Determination of red cell acetylcholinesterase activity by diagnostic kit; modification of the method.** *Acta. Vitaminol. Enzymol. 24(6): 219-221; 1970.* (2 references)

The authors have used the Boehringer-Mannheim cholinesterase assay kit (DNTB method) for the determination of red cell acetylcholinesterase activity for several years, and have found that although the reproducibility was good (variation coefficient 5.96%), a few modifications would allow increased accuracy and convenience. In order to alleviate the problem of red cell turbidity and sedimentation during readings, an additional 1:5 dilution step of the red cell suspension was introduced. The final substrate concentration was also reduced to the point where it gave the optimum thiocholine production rate. Optical density readings were made every 60 sec for 6 min (twice the respective time periods in the kit method) and corrected for nonenzymatic hydrolysis of the substrate. Finally, the AChE activity was calculated in terms of packed red cell volume rather than red cell count, since the possibility of error in the latter is high.

72-1094. Petrosini, G.; Tafuri, F.; Businelli, M.; Scarponi, L. (Istituto di Chimica Agraria dell'Universita di Perugia, Perugia, Italy). **Residui del 2,4,5-TP nel riso. [Residues of 2,4,5-TP in rice.]** *Agrochimica 15(6): 485-493; 1971.* (12 references) (Italian)

A gas chromatographic method was developed for quantitative determination of 2,4,5-TP (silvex) residues in rice. The pesticide is extracted from the rice by permitting it to stand overnight in a chloroform-ethyl ether mixture acidified with glacial acetic acid, then saponified with potassium hydroxide. The solution is washed with ether, then acidified and extracted with ether. The herbicide is esterified with diazomethane, and a toluene solution of the ester obtained is analyzed in a gas chromatograph with an electron capture detector. The average recovery from known samples was 92%, and the limit of detection, 0.005 ppm for white rice and 0.01 ppm for unpolished rice. This method was applied to rice samples obtained from various farms on which 2,4,5-TP had been applied at rates of 0.77 to 1.34 kg/ha; in none of the polished or unpolished rice samples was any of this herbicide detected by the present method.

72-1095. Lopez Gonzales, J. de D.; Gonzales Gomez, C.; Quereda, M. A. (Seccion de Radioquimica del Departamento de Quimica Inorganica de la Facultad de Ciencias de la Universidad de Granada, Granada, Spain). **Determination mediante cromatografia de gases de algunos isomeros y compuestos afines al DDT. [Gas chromatographic determination of some DDT isomers and related compounds.]** *An. Quim. 67(9-10): 845-851; 1971.* (18 references) (Spanish)

A gas chromatographic method is described for the determination of small amounts ($\sim 10^{-6}$ g) of *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDE and DBP. In calculating the relative retention volumes, aldrin was used as the standard. The behavior of two different glass columns (DC-200 + QF-1 on Gas Q and Dow-11 on Aeropak-30) was compared; an electron-capture detector with a tritium source was used (300 mCi). The carrier gas (nitrogen) was introduced at the rate of 40 ml/min; the column temperature was 190°C, injector temperature 210°C, and detector temperature 200°C. Within the linear range for each of the pesticides investigated (approximately 0.1 to 10 ng) the relationship between the quantity of substance and the area of the corresponding chromatographic peak was established. The accuracy of the method is discussed.

72-1096. Hengy, H.; Thirion, J. (Research Dept. Rupert International Ltd., Stellenbosch, Republic of South Africa). **The determination of thiodan and thiodan sulphate on tobacco and in smoke condensate.** *Beitr. Tabakforsch. 6(2): 57-61; 1971.* (8 references)

A method developed for gas chromatographic determination of α- and β-Thiodan (endosulfan) and Thiodan sulfate on tobacco and in smoke condensate permits quantitative determination of concentrations as low as 0.01 ppm. For tobacco, the method comprised extraction with acetonitrile, followed by column chromatography (elution with benzene after removal of DDT and other interfering substances with *n*-hexane), then gas chromatography. Gas chromatography of the smoke condensate was preceded by partitioning cleanup, column chromatography and thin-layer chromatography. Thiodan and Thiodan sulfate residues of 0.02 to 0.3 ppm and 0.02 to 0.05 ppm respectively were found in leaf tobaccos. Cigarettes manufactured from Virginia tobacco contained 0.1 to 0.2 ppm Thiodan and less than 0.05 ppm Thiodan sulfate. Between 14.5% and 16.3% of Thiodan or Thiodan sulfate in cigarette tobacco is transferred into the mainstream smoke; possible reactions of thiodan during smoking are considered.

72-1097. Vengerskaya, Kh. Ya.; Zelinskaya, O. V. (Uzbek Research Inst. of Sanitation, Hygiene, and Occupational Diseases, Tashkent, USSR). **Ob opredelenii mil'beksa v ob"ektakh vneshney sredy. [Determination of Milbex in environmental objects.]** *Gig. Sanit. 36(6): 64-65; 1971.* (2 references) (Russian)

Milbex was extracted from water, soil, and air samples, and its two components BCPE (1,1-bis(4-chlorophenyl)ethanol) and CPAS (4-chlorophenyl-2,4,5-trichlorophenyl azosulfide) were determined colorimetrically. Air samples were collected on filters and silica gel by aspiration followed by extraction into *n*-hexane. Water and soil samples were also extracted into *n*-hexane. BCPE was determined by addition of a 5% solution of *p*-dimethylaminobenzaldehyde in sulfuric acid (3:1) followed by heating for 15 min on a water bath.

CPAS was determined by reaction with α-naphthylamine in acetic acid. The sensitivity for the BCPE determination was 1 μg in the volume analyzed.

72-1098. Klisenko, M. A.; Verblyudova, N. I. (All-Union Res. Inst. of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **Spetsificheskiy metod opredeleniya polikhlorpinena v biologicheskom materiale. [A specific method for determining polychloropinene in biological matter.]** *Gig. Sanit. 36(7): 72-75; 1971.* (1 reference) (Russian)

Microthin-layer chromatography has been used to identify 1-2 μg amounts of polychloropinene in various animal tissues in the presence of other organochlorine pesticides. Animal tissues are extracted with *n*-hexane; the extract is then washed with concentrated sulfuric acid. Blood and urine are extracted three times with ethyl ether, filtered through anhydrous sodium sulfate, distilled and evaporated. The extracts are then chromatographed on microthin-layers (3-10 μ) of silica gel in a *n*-hexane:methanol:ammonia (10:4:0.3) solvent system. The plates are then sprayed with a 0.5% diphenylamine-zinc chloride solution in acetone and heated for 10 min at 130 to 140°C. Polychloropinene appears as a bluish-green spot on a white background. The size and color intensity of the spots are compared visually with those of a standard solution. The method is also useful for determining polychlorocamphene (toxaphene).

72-1099. Klisenko, M. A.; Pis'mennaya, M. V. (All-Union Research Inst. of Hygiene and Toxicology of Pesticides, Polymers, and Plastics, Kiev, USSR). **Opredeleniye sayfosa v vozdukhe metodom khromatografi v tonkom sloye. [Determination of Sayfos in air by thin-layer chromatography.]** *Gig. Sanit. 36(8): 72-74; 1971.* (4 references) (Russian)

Sayfos (Menazon) is collected on filters and on silica gel by drawing air through them, and is then extracted with ether. Thin-layer chromatography was performed on silica gel plates using acetone:*n*-hexane: ammonia (15:5:3) as a developing solution. After drying, the plates are sprayed with an acetone solution of bromphenol blue, to which diluted silver nitrate was added, followed by heating at 35 to 40° for 10 min. The plates were then sprayed with 10% acetic acid. Sayfos appeared as an intense blue spot on a light background, Rf 0.44. Quantitative determination was done visually by comparison with intensity of coloring and size of spots of standard solutions. The sensitivity of the method is 0.2 μg in a sample.

72-1100. Vengerskaya, Kh. Ya.; Demidenko, M.; Mayorova, T.; Izmaylova, G. D. (Tashkent Research Inst. of Legal Investigation, Tashkent, USSR). **Metody opredeleniya nekotorykh defoliantov v vozdukhe. [Methods for the determination of defoliants in air samples.]** *Gig. Sanit. 36(8): 109-110; 1971.* (Russian)

Colorimetric determination of defoliants such as magnesium chlorate-chloride ($Mg(ClO_3)_2 \cdot MgCl_2$) or calcium chlorate-chloride ($Ca(ClO_3)_2 \cdot CaCl_2$) is based on their reduction with ferrous ions in acid media in boiling solutions; the resultant ferric ion is then determined as ferricyanide in acid solution. Magnesium chlorate-chloride can also be determined as Mg ion according to its reaction with titanium yellow in alkaline medium. Acrofol (*cis*-β-chloroacrylic acid, sodium salt) forms a colored compound with pyridine in alkaline solution. The absorption peaks for calcium chlorate-chloride and acrofol determinations are 260 nm and 220 nm respectively. Magnesium chlorate-chloride has no absorption peak. Magnesium and calcium chlorate-chloride aerosols can be absorbed on defatted cotton and vinyl chloride filters; acrofol vapors are collected by aspiration through absorbers containing distilled pyridine.

72-1101. Golubev, T. I.; Volkova, V. A. (All-Union Research Inst. of Plant Protection, Leningrad, USSR). **Khromatograficheskiy [v tonkom sloye] mikrometod opredeleniya fosfamida v fruktakh i ovoshchakh. [Determination of phosphamide in fruits and vegetables by thin-layer chromatography: a micromethod.]** *Gig. Sanit. 36(10): 69-73; 1971.* (5 references) (Russian)

A method for the determination of microamounts of phosphamide (dimethoate) in biological material by TLC is presented. Purification of chloroform extracts of water filtrates is performed by TLC on silica gel in an *n*-hexane:ethyl acetate (1:1) mixture, where the pesticide appears at an Rf of 0.11 or 0.12. The phosphamide-containing silica gel strip is then removed, shaken with distilled water, vacuum filtered and reextracted with chloroform. The extract is then concentrated to 0.1 to 0.2 ml under vacuum and chromatographed with a chloroform-acetone (9:1) system until the solvent front reaches 10 cm. Plates are dried at room temperature and developed with brilliant green and bromine vapors. Yellow spots with an Rf 0.35 indicate the presence of phosphamide. Minimum detectable amounts are 0.2 μg, according to tests performed on apple and cabbage samples.

72-1102. Kuchak, Yu. A. (Institute for Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **Opredeleniye zaderzhki pestitsidov v organakh dykhaniya laboratornykh zhivotnykh. [Determination of the retention of pesticides in the respiratory organs of laboratory animals.]** *Gig. Tr. Prof. Zabol. 15(8): 57-58; 1971.* (2 references) (Russian)

An apparatus for determining the retention of pesticides in respiratory organs is described. Air is fed by a blower across a rotameter to a mixing flask containing the solution of the pesticide to be investigated, or to an aerosol chamber. The pesticide concentration is controlled by varying the concentration and the temperature of the solution, or the air flow volume. Inspired air

flows through an inlet valve across a mask; the respiration rate and the time ratio of inhalation to exhalation are regulated with an electromechanical chopper. Exhaled air is led to the respirator over an absorber, filled with a suitable absorbent for the substance studied. The fraction of the air not inhaled is measured with a flowmeter. The portion of the inhaled pesticide quantity in the exhaled air is determined by weighing the absorber after the desired exposure time.

72-1103. Mukherjee, G.; Mathew, T. V.; Mukherjee, A. K.; Mitra, S. N. (Central Food Lab., Calcutta, India). **Identification and separation of chlorinated pesticides by TLC on magnesium hydroxide.** *J. Food Sci. Technol. 8: 152-153; 1971.* (12 references)

The chlorinated pesticides DDT, lindane, endrin, and heptachlor have been successfully separated using magnesium hydroxide on a thin-layer plate. Separation was achieved only if the plates were dipped in an 8% paraffin oil in petroleum ether solution before spotting. The carrier solvent used was 90% methanol, and spots were developed by spraying with 0.5% *N,N*-dimethyl *p*-phenylenediamine HCl and distilled water and subsequent exposure to ultraviolet light. Magnesium hydroxide is more economical than silica gel, the layers are harder and more resistant to chipping and abrasion, and the plates can be preserved and handled with ease.

72-1104. Szokolay, A.; Mahel'ova, H.; Kovac, J.; Berenderova, I. (Forschungsinstitut fuer Hygiene, Bratislava, Czechoslovakia). **Beitrag zur Anwendung der enzymatischen Diffusionsmethode auf Agar-Agar (nach Sandi) zur Bestimmung von Organophosphor-Insektizidrueckstaenden in Citrussaeften. [Use of the agar enzyme diffusion method (according to Sandi) for determining organophosphorus insecticide residues in citrus juices.]** *Nahrung 15(5): 567-573; 1971.* (9 references) (German)

The use of the enzymatic diffusion method according to Sandi for determining organophosphorus insecticides of the parathion type gave maximum recoveries of 71%, according to radiochemical check tests. The insecticides were separated from citrus juice on a silica column. Elution of the column with petroleum ether was introduced in place of extraction with isopropyl alcohol, and supplemented by an additional isolation on a dry alumina layer; the yield obtained for ^{32}P-fenitrothion by this method was 95%. The reproducibility of the enzymatic reaction according to Sandi was very good for methyl parathion and fenitrothion; in the case of malathion, it can be improved by replacing the bromine with peracetic acid for activation. The annular surface area rather than the diameter of the zone of inhibition was used to form the ratio with the concentration in the evaluation. A solution of lyophilized horse serum was used as the cholinesterase source on the plate. The suggested method is more time-consuming than the original method of Sandi, but offers greater selectivity and recovery rates.

72-1105. Hadorn, H.; Zuercher, K. (Laboratoire Central de la Coop Suisse, Basel, Switzerland). **Dosage de residue d'insecticides chlores dans le cacao et les chocolats. [Determination of organochlorine insecticide residues in cacao and chocolate.]** *Rev. Int. Choc. 27(1): 2-11; 1971.* (4 references) (French)

A method was developed for determination of organochlorine insecticide residues in chocolate raw materials and semi-finished and finished chocolate products. The insecticides are extracted with petroleum ether and cleaned up by absorption on diatomaceous earth, followed by two column chromatographic steps entailing elution with a polar and a nonpolar solvent. Gas chromatographic retention times are then determined on two columns of different polarities (sulfuric acid and magnesium oxide). Recovery of most organochlorine insecticides with this method is satisfactory, except for α- and β-BHC. Of the materials tested, only the almonds and walnuts added to the finished products were free from organochlorine residues; BHC isomers were found in all other materials (cacao nibs with shells, cacao butter, powdered whole milk, bitter chocolate and sweet chocolate) at trace level to 122 ppb; dieldrin at 86 ppb in cacao nibs and 140 ppb in Swiss whole milk powder. Whole milk powder from Finland contained less than 25 ppb of BHC isomers and traces of DDT-derived compounds. From 3 to 8 unidentified peaks were found in each case.

72-1106. Koshcheyev, A. K.; Livshits, O. D. (Author address not given). **Eskpressnyy metod opredeleniya sevina v pishchevykh productakh. [A rapid method for Sevin determination in food products.]** *Voenno-Med. Zh. 11: 70-71; 1970.* (Russian)

A qualitative method for detection of Sevin (carbaryl) is presented. A cotton wad impregnated with a 0.1 *N* NaOH solution in 50% ethyl alcohol is rubbed against the surface of the object to be analyzed and the cotton is then exposed to UV in a dark chamber. Greenish luminescence appears in the presence of carbaryl and dark violet luminescence occurs in its absence. The whole procedure takes 3 to 5 min. Dust and other impurities produce no interference. Benzene extraction is used under laboratory conditions and the reagent is applied to the dry residue of the extract. Detection limit is 0.5 μg of carbaryl per sample.

72-1107. Bohn, G.; Ruecker, G.; Luckas, K. H. (Institut fuer Gerichtliche Medizin und Institut fuer Pharmazeutische Chemie der Westfaelischen Wilhelms-Universitaet, Muenster, Germany). **Massenspektrometrischer und gaschromatographischer Nachweis von Parathion aus Leichenmaterial bei Giftmord. [Mass spectrometric and**

gas chromatographic detection of parathion in autopsy material after murder by poisoning.] *Z. Rechtsmed. 68: 45-52; 1971.* (21 references) (German)

A gas chromatographic and mass spectrometric analytical method suitable for determining tissue parathion levels in autopsy material from suspected poisoning cases is described. The method applied gas chromatography with a halogen-phosphorus flame ionization detector to pentane or methanol extracts of tissue homogenates, gastric contents or other autopsy material, previously dehydrated with sodium sulfate. The limit of detection for organophosphorus insecticides with this equipment is in the nanogram range, and selective detection of parathion in the presence of chlorothion, fenitrothion, methyl parathion and paraoxon is possible. Mass spectrometry for parathion detection was performed on samples prepared by thin-layer chromatography. Both the principal peak and the fragments obtained for pure parathion and from the tissue samples were in agreement; the mass spectrum is shown and the principal fragmentation reactions discussed. Tissue parathion levels were conclusive for poisoning as the cause of death in both of the cases.

72-1108. Bogusz, M.; Borkowski, T. (Inst. for Legal Expertise, Cracow, Poland). **Anwendung des Indoxylacetates als Substrat fuer enzymatischen Nachweis der phosphororganischen Schaedlingsbekaempfungsmittel mit der Methode der Duennschichtchromatographie. [Use of indoxylacetate as the substrate for enzymatic determination of organophosphate pesticides by thin-layer chromatography.]** *Z. Rechtsmed. 68: 267-272; 1971.* (11 references) (German)

Thin-layer chromatography with enzymatic detection, as described by Mendoza *et al.*, is suitable for detection of organophosphate insecticide levels for forensic purposes, especially in view of the high sensitivity offered by the use of indoxylacetate as the substrate. Organophosphate pesticide residues were detected by this method in 5 out of 6 extracts of liver or gastric contents obtained from suspected pesticide poisoning victims; enzymatic detection was far more sensitive than the nonenzymatic thin-layer chromatographic tests applied to the same specimens. The developed chromatographs are stable for at least one year. Extracts of organs or organ contents obtained from persons dying of causes other than insecticide poisoning did not provide any troublesome artefacts. Indoxylacetate gives results as good as those obtained with 5-bromoindoxylacetate and is far less expensive. The following limits of detection were found: methyl parathion, 10 ng; dichlorvos, 10 ng; disulfoton, 100 ng; malathion, 100 ng; methyl-demeton-methyl, 100 ng; demeton-*O*-methyl, 200 ng; demeton-*O*-methyl sulfoxide, 200 ng; Folithion, 200 ng; fenthion, 500 ng; thiometon, 500 ng; dimethoate, 500 ng; trichlorfon, 500 ng.

72-1109. Shiller, J. W.; Campbell, D. N. (Author address not given). **Pesticide detection using gas chromatography and flame photometry.** *Bendix Tech. J. 4(3): 51-55; 1971.* (4 references)

A new sulfur/phosphorus emission detector (SPED) has been developed for use in conjunction with gas chromatographic analysis of pesticides. It is a two-channel flame photometer which utilizes the chemiluminescent reactions of HPO and sulfur. The phosphorus emission is linear in relation to concentration and the sulfur emission is quadratic. The flexible fiber optics used to collect and transmit the light emitted provide thermal insulation, permitting burner-chamber operation at elevated temperatures. Installation is easier because the phototube housing does not have to be immediately adjacent to the burner chamber. Fiber optics can be oriented to eliminate unwanted light. Since each channel responds to both sulfur and phosphorus, and since hydrocarbons can interfere, several methods are given for easily analyzing confusing chromatograms.

72-1110. Yuki, F.; Murano, A. (Takarazuka Research Lab., Sumitomo Chemical Co. Ltd., Takatsukasa, Takarazuka-shi, Hogyo-ken, Japan). **[Analytical studies on pesticides and related compounds. XV. Improved determination of several organophosphorus pesticides.]** *Bunseki Kagaku (Jap. Anal.) 21(3): 375-378; 1972.* (7 references) (Japanese)

An improved method was developed for the quantitative determination of Conen, Sumithion (fenitrothion), Surecide, Cyanox, malathion, dimethoate, Papthion (phenthoate), EPN, salithion, diazinon and similar organophosphate pesticides. Chloroform extracts were cleaned up by TLC, then the extracted material digested with sulfuric acid (50%) and nitric acid. The phosphate released in this manner was determined colorimetrically (420 nm) with ammonium metavanadate and ammonium molybdate. This method is superior to the previously used one, which employed perchloric acid for digestion and was thus hazardous. However, dichlorvos could not be determined in this manner because it decomposed during TLC. Dichlorvos can be determined using a TLC plate containing 10% PEG-1000 or PEG-2000, and perchloric acid for digestion.

72-1111. Kutty, K. M.; Hutton, C. J.; Khan, W. (Biochemistry Dept., Janeway Child Health Centre, St. John's, Newfoundland, Canada). **An ultramicro technique for the assay of serum cholinesterase: results in normal children and in children with infectious hepatitis.** *Clin. Biochem. 4(4): 259-262; 1971.* (13 references)

An ultramicro analytical method (requiring 10 microliters of serum) was developed for serum cholinesterase analysis, using acetylcholine bromide as the substrate. Serum cholinesterase values for 142 normal

children, 6 mo to 15 yr old, ranged from 144 to 310 units and averaged 207 ± 33.7 units. Duplicate determinations performed with Monitrol I on 20 different days gave a coefficient of variation of less than 10%; significant differences between the age groups tested were not found. Statistically significant reductions in cholinesterase and serum albumin values in children with hepatitis, as compared to controls (107 units and 3.5 mg% respectively vs. 197 units and 4.2 mg% respectively), were accompanied by significantly elevated glutamic-oxalacetic transaminase (SGOT) values (786 R.F. units, compared to 41 units in controls). During the convalescent phase of hepatitis, cholinesterase values rise and SGOT values drop toward normal. The correlation between cholinesterase and SGOT values in health and disease is not unexpected, since both of these enzymes are believed to be synthesized in the liver.

72-1112. Locke, R. K. (Div. of Toxicology, Food and Drug Admin., Dept. of HEW, Washington, DC 20204). **Possible *in vitro* production of *N-O*-conjugates of *N*-hydroxycarbaryl from carbaryl by tobacco cells in culture.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 31(2): 520; 1972.*

N-Hydroxy metabolites are frequently carcinogens and/or mutagens. Possible *N*-hydroxy metabolites of carbaryl (1-naphthyl *N*-methylcarbamate), a pesticide commonly used on food crops, have not been previously reported. In thin-layer solvent systems commonly used in carbaryl metabolism studies, *N*-hydroxycarbaryl (1-naphthyl *N*-hydroxy, *N*-methylcarbamate) was not separated from carbaryl and/or 5-hydroxycarbaryl. Two solvent systems, separating *N*-hydroxycarbaryl from other common carbaryl metabolite aglycones, were therefore developed. Tobacco cells in suspension culture provide a rapid system for the investigation of metabolism by plant tissue. Carbaryl, labeled with ^{14}C in the ring C_1 position was added to a sterile culture flask (2.4×10^{-4} μCi; 8.8 ppm), the solvent evaporated, 30 ml of a 10-day culture of tobacco cells and 100 ml of culture medium were added, and the flask incubated in the dark for 11 days at 27°C. The cells (containing 9% of the added radioactivity) were separated from the medium, washed, homogenized with distilled water, and centrifuged at 7000 × *g*. The supernatant was hydrolyzed with 0.1 *N* HCl, extracted with methylene chloride, and the extract thin-layer chromatographed with known standards. Sixteen percent of the radioactivity co-chromatographed with *N*-hydroxycarbaryl and may represent *N-O*-conjugates of *N*-hydroxycarbaryl (of unknown biological effects). (Abstract No. 1729, 56th Annual FASEB Meeting, Atlantic City, N.J., April 9-14, 1972, reprinted by permission.)

72-1113. Kennedy, M. V.; Stojanovic, B. J.; Shuman, Jr., F. L. (Mississippi State U., State College, MS 39762). **Analysis of decomposition products of pesticides.** *J. Agr. Food Chem. 20(2): 341-343; 1972.* (6 references)

Analyses were conducted to identify the products formed upon chemical or thermal decomposition of 20 selected pesticides. The gaseous products resulting from heat treatment were analyzed by gas chromatography, infrared spectra, adsorption onto solids, or absorption into liquids. The wide variety of products made it necessary to employ electron capture, hydrogen flame ionization, and thermal conductivity detectors for the gas chromatographic analyses. Thermal decomposition products occurring were carbon dioxide, carbon monoxide, nitrogen oxides, hydrochloric acid, and residues of inorganic compounds. Analyses performed to determine the decomposition products when the pesticides were exposed to chemicals gave a variety of compounds, depending on the chemical used. The decomposition product(s), if any, is identified for certain of the pesticides after exposure to the potential decontaminants. These products include compounds formed by oxidation, reduction, molecular structure rearrangement, and decomposition. (Author abstract reprinted by permission of the American Chemical Society).

72-1114. Ercegovich, C. D.; Witkonton, S. (Dept. of Entomology and the Pesticide Research Lab., Pennsylvania State U., University Park, PA 16802). **An improved method for the analysis of residues of isopropyl *N*-(3-chlorophenyl)carbamate (chlorpropham) in alfalfa.** *J. Agr. Food Chem. 20(2): 344-347; 1972.* (26 references)

Variable, and often excessive, amounts of interfering plant materials in alfalfa render conventional colorimetric methods of analysis for chlorpropham residues ineffective for this crop. An improved colorimetric method for the analysis of chlorpropham residues in alfalfa is presented. The herbicide residue is directly hydrolyzed in the crop sample by alkali to 3-chloroaniline, which is simultaneously extracted into a nonpolar solvent by means of steam distillation through the use of a Bleidner apparatus. Quantitative determination of the recovered 3-chloroaniline is accomplished by spectrophotometric measurement of its colored complex with *N*-ethyl-1-naphthylamine (535 nm) after it has been separated from interfering colored complexes derived from plant materials by means of cellulose column chromatography. The sensitivity of this method is equivalent to 0.02 ppm for a 25g sample of alfalfa. (Author abstract reprinted by permission of the American Chemical Society).

72-1115. Guardigli, A.; Chow, W.; Lefar, M. S. (Dept. of Analytical Chemistry, Rhodia, Inc., New Brunswick, N.J. 08903). **Determination of carbetamide residues and its aniline metabolite.** *J. Agr. Food Chem. 20(2): 348-350; 1972.* (3 references)

Carbetamide [D(−)-phenylcarbamoyloxy-2-(*N*-ethylpropionamide)] is a selective herbicide which controls weeds in alfalfa and cereals by preemergence and/or postemergence applications. The parent compound and its aniline metabolite were separated by liquid-liquid partition of the crop extract. After acid hydrolysis the carbetamide afforded quantitative yields of ethylamine and aniline which were converted to the corresponding amides with 4-bromobenzoyl chloride. The amides were then separated by column chromatography on Florisil. The limits of detection of these derivatives by electron-capture gas chromatography were generally less than 0.05 ppm and in some cases less than 0.02 ppm. (Author abstract reprinted by permission of the American Chemical Society.)

72-1116. Seiber, J. N. (Dept. of Environmental Toxicology, U. of California, Davis, CA 95616). ***N*-Perfluoroacyl derivatives for methylcarbamate analysis by gas chromatography.** *J. Agr. Food Chem. 20(2): 443-446; 1972.* (19 references)

Methylcarbamate insecticides react rapidly and quantitatively withth trifluoroacetic (TFA), pentafluoropropionic (PFP), and heptafluorobutyric (HFB) anhydrides to give *N*-perfluoroacylated derivatives. Unlike many of the parent methylcarbamates, the derivatives are stable to gas chromatographic conditions and detected at low levels by the electron-capture and alkali-flame ionization detectors. The infrared, nmr, and mass spectral properties of the compounds are characteristic and permit ready qualitative identification. The applicability of trifluoroacetylation to eight methylcarbamate insecticides and the metabolites of carbofuran was demonstrated. (Author abstract reprinted by permission of the American Chemical Society.)

72-1117. Feklisova, L. S. (Author address not given). **Quantitative spectrophotometric determination of DDT in solution after its isolation by thin-layer chromatography.** *J. Anal. Chem. 26(7, Pt.2): 1293-1294; 1971.* (3 references)

A method for quantitatively determining DDT utilizes chromatography on a thin-layer plate of KSK silica gel, alumina and gypsum, followed by elution with hexane and UV spectrophotometric assay. The sorbent does not affect the absorbance of the DDT solution. From 5 to 30 μg of DDT can be determined with a relative error of ±5%. Translated from *Zh. Anal. Khim. 26(7): 1446-1448; 1971.*

72-1118. Kosmatyy, Ye. S.; Bublik, L. I. (Ukrainian Research Inst. for Plant Protection, Kiev, USSR). **Opredeleniye epoksida geptakhlora v pochve metodom tonkosloynoy khromatografii. [Determination of heptachlor epoxide in soil samples by means of thin-layer chromatography.]** *Khim. Sel. Khoz. 9(8): 595; 1971.* (6 references) (Russian)

n-Hexane soil sample extracts (2 hr shaking), reduced to small volumes (distillation on water bath), are applied to thin-layer chromatography plates. The chromatographic layer consists of a 1:1 mixture of plaster-bound silica gel (40 to 60 mesh) and aluminum oxide. Heptane is used as a carrier liquid and the plates are air dried when the solvent front reaches 10 to 12 cm, and developed by spraying with a 1% solution of diphenylamine in acetone. Exposure to UV reveals purplish-grey spots corresponding to heptachlor expoxide within 10 min. The size of the spots is compared to those obtained with spots containing a known amount of heptachlor epoxide, and quantities computed accordingly. Sensitivity of the method reaches 10 μg per 100 g soil sample with a relative error ranging from ±3.4 to ±7.4% for the 95% confidence interval.

72-1119. Ragab, M. T. H. (Research Station, Canada Dept. of Agriculture, Nova Scotia, Canada). **Methyl yellow as a single chromogenic reagent for the thin layer chromatographic detection of organophosphorus pesticides and their breakdown products.** *Lab. Pract. 20: 489-491; 1971.* (9 references)

In a novel rapid detection method for organophosphorus pesticides on microthin-layer chromatographic plates, the pesticide spots are made visible by spraying with methyl yellow. The developed plates, coated with microcrystalline cellulose, may be sprayed with the chromogen directly or after exposure to bromine vapor. In the first case, the pesticide spots appear bright yellow with the acidic breakdown product pink against a yellow background; in the second case, most spots appear pink against a yellow background. The yellow spot color can be intensified by heavy spraying and cool air drying. The pink spots are very well defined and the area proportional to concentration. Sensitivity is estimated at less than 2 μg for most compounds. The pink spots persist for a long time when protected from light; microchromatoplate images can be projected onto a screen or photocopied and the spot areas determined for semiquantitative estimation.

72-1120. Visweswariah, K.; Majumder, S. K.; Jayaram, M. (Central Food Technological Research Inst., Mysore 2a., India). **A colorimetric method of estimating hydrolyzable chlorine in lindane (γ-hexachlorocyclohexane).** *Microchem. J. 17(1): 26-30; 1972.* (10 references)

Dehydrochlorination of organochlorine insecticides, followed by determination of the labilized chlorine, has served as the basis for a series of increasingly reliable and specific analytical methods. Monoethanolamine is particularly useful as the dehydrohalogenating agent in the analysis of pesticide mixtures or food extracts, since it permits the elimination of many interfering substances upon adjusting the experimental

conditions. Determination of unconsumed monoethanolamine in the reaction mixture with *p*-nitrobenzenediazonium fluoborate offers a rapid, reliable method for estimating the labilized chloride. A blood red color (λmax = 540 nm) develops immediately upon the addition of the ethanolic color reagent solution to the hydrolyzed reaction mixture. The color developed follows Beer's Law and is stable for 15 to 20 min in the case of solutions containing 80 to 310 μg/ml of lindane. At higher lindane concentrations, the color is rapidly bleached by the trichlorobenzenes released during hydrolysis.

72-1121. Takahama, K.; Araki, S.; Kataoka, S.; Matumoto, K.; Kakihara, Y.; Ogata, Y.; Kanda, M. (Dept. of Legal Medicine, Kumamoto U. Medical School, Kumamoto, Japan). **Ultraviolet spectrophotometry of organic synthesized pesticides.** *Nippon Hoigaku Zasshi (Jap. J. Leg. Med.) 25(1): 85-90; 1971.* (16 references)

Representatives of four classes of organic pesticides were analyzed for ultraviolet absorption spectra after separation of components by silica gel column chromatography. Of the 15 organophosphate formulations studied, the basic components of 10 showed absorption maxima. Those suitable for identification by ultraviolet spectrophotometry were: Ekatin (thiometon), PMP (phosmet), Estox (ESP), chlorthion, Baycid (fenthion), DDVP (dichlorvos), and Sumithion (fenitrothion). Of 7 mercurials tested, Sanmicron (PMA), Hexamercury, Soilsin (methylmercuric iodide + ethylmercuric phosphate) and Similton had characteristic spectra. Chlordane, Triazin, DDT, Chlorbenzilate, and CCS, of the 12 organochlorines studied, showed absorption minima and maxima. Differences in literature values and in values obtained before and after chromatography are attributed to solvent differences, chemical impurities and chemical reactions.

72-1122. Hayashi, T.; Kato, S.; Watanabe, H.; Hara, Y.; Tanimura, A. (National Inst. of Hygienic Sciences, 18-1 Kamiyoga 1-chome, Setagaya-ku, Tokyo, Japan). **[Determination of diphenyl in citrus fruits.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 13(1): 78-84; 1972.* (6 references) (Japanese)

Diphenyl (biphenyl) is approved in Japan as a food additive for the impregnation of citrus fruit wraps to prevent rot in grapefruit, lemons and oranges. Biphenyl residues in the whole fruit must not exceed 70 ppm; a method has been developed for the determination of biphenyl in citrus fruits. A whole fruit is homogenized in water and the homogenate is steam-distilled with cyclohexane as the solvent. The cyclohexane solution is cleaned up by TLC on a silica gel plate containing a fluorescent indicator. The spot is extracted with cyclohexane and the absorption read at 248 nm. For the gas chromatographic determination, the biphenyl peak was separated from other peaks due to essential oils in the fruit with polyethylene glycol, and biphenyl was determined by the internal standard method using 2,3-dimethyl-naphthalene. Imported lemons contained 1.15 to 3.56 mg of biphenyl (UV) or 4.54 to 4.68 mg (GC). The discrepancy is assumed to be due to differences in the fruit surface area exposed to biphenyl vapor in the container, for when a known amount of biphenyl (5 or 10 mg/fruit) was added to the homogenate and determined as above, 91 to 96% recovery was achieved by either method. The average biphenyl concentration in imported oranges was 56.5 ppm, and this figure did not decrease significantly after 25 days of storage. Biphenyl is assumed to dissolve in the fruit peel oil.

72-1123. Akagi, H.; Fujita, M.; Sakagami, Y. (Inst. of Public Health, 4-6-1-Shirokanedai, Minato-ku, Tokyo, Japan). **[Thin-layer chromatography of inorganotin and organotin compounds in foods.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 13(1): 85-88; 1972.* (8 references) (Japanese)

In a previous paper, the authors reported a thin-layer chromatographic technique for the separation of inorganic and organic tin compounds. In the present paper, a rapid and simple thin-layer chromatographic procedure is described for the identification of tin compounds in foods. Tin compounds such as tin tetrachloride, *n*-butyltin trichloride, di-*n*-butyltin dichloride, tri-*n*-octyltin chloride, phenyltin trichloride, diphenyltin dichloride and triphenyltin chloride (a fungicide) added to foods such as tomatoes, malt vinegar, fermented soy sauce and Worcestershire sauce were easily extracted with diethyl ether from the specimens acidified with hydrochloric acid or converted to the thiocyanates. In the extraction procedure, the ether contained in the emulsion-suspension formed by vigorous shaking of each specimen was separated by centrifugation, using filter paper and a perforated teflon disc. After evaporation of the extracts to dryness, inorganic tin and organic tin compounds in the residues were identified by thin-layer chromatography.

72-1124. Abbasov, T. G. (All-Union Inst. of Vet. Sanitation). **Opredeleniye khlorofosa v myase i moloke pri pomoshchi tonkosloynoy khromatografii. [The determination of chlorophos in meat and milk by thin-layer chromatography.]** *Veterinariya 1: 101-102; 1971.* (Russian)

Chlorophos (trichlorfon) is extracted from meat with chloroform, filtered and evaporated. It is extracted twice with distilled water, filtered and extracted twice again with chloroform. The extract is dried with anhydrous sodium bisulfate and evaporated. The dry residue is dissolved in chloroform and a drop of this is placed on a slide. Dry residue is also placed in the center of the drop. Extraction from milk differs slightly. Acetone is added to the milk; the solution is agitated, filtered and distilled. The water phase is filtered and extracted twice

with chloroform. The combined extracts are then dried with anhydrous sodium bisulfate, evaporated, extracted with chloroform and subjected to chromatography. The method can detect up to 10 μg of chlorophos. The amount of chlorophos is determined by a visual comparison of the color intensity and spot size of the sample and a standard. A formula for computing results of the analysis is given.

See also **72-0943** **72-0945** **72-0959** **72-1080**

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